

# AWSome Day

Joe Hanko  
AWS Technical Trainer



# Agenda

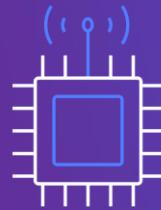
## Introduction to AWS

- Compute
- Storage
- Databases
- Networking
- Security

## Innovation with AWS

## Next steps

# Innovation with AWS



Internet of  
Things  
(IoT)



Machine  
learning  
(ML)



Blockchain



AWS Ground  
Station



AWS  
Wavelength

More on this later!

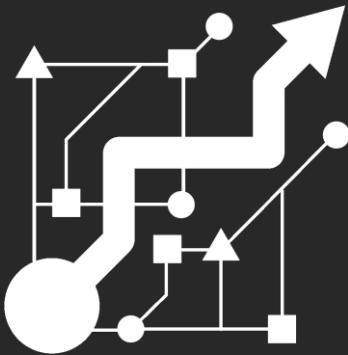
# Section 1: Introduction to AWS

# Introduction to the cloud

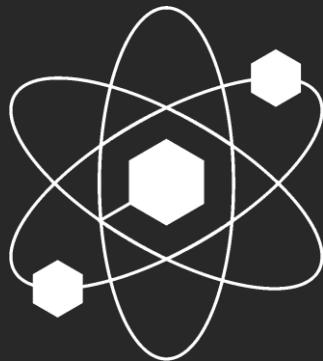


# what is the cloud?

Cloud computing enables you to stop thinking of your infrastructure as hardware, and instead think of it (and use it) as software



Programmable  
resources



Dynamic  
abilities



Pay as  
you go

What other advantages does the cloud offer?

# Six advantages of cloud computing



Trade upfront  
expense for  
variable expense



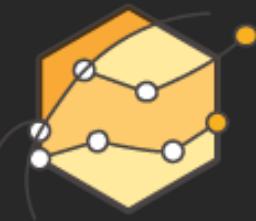
Increase speed  
and agility



Benefit from massive  
economies of scale



Stop spending  
money on running and  
maintaining data centers

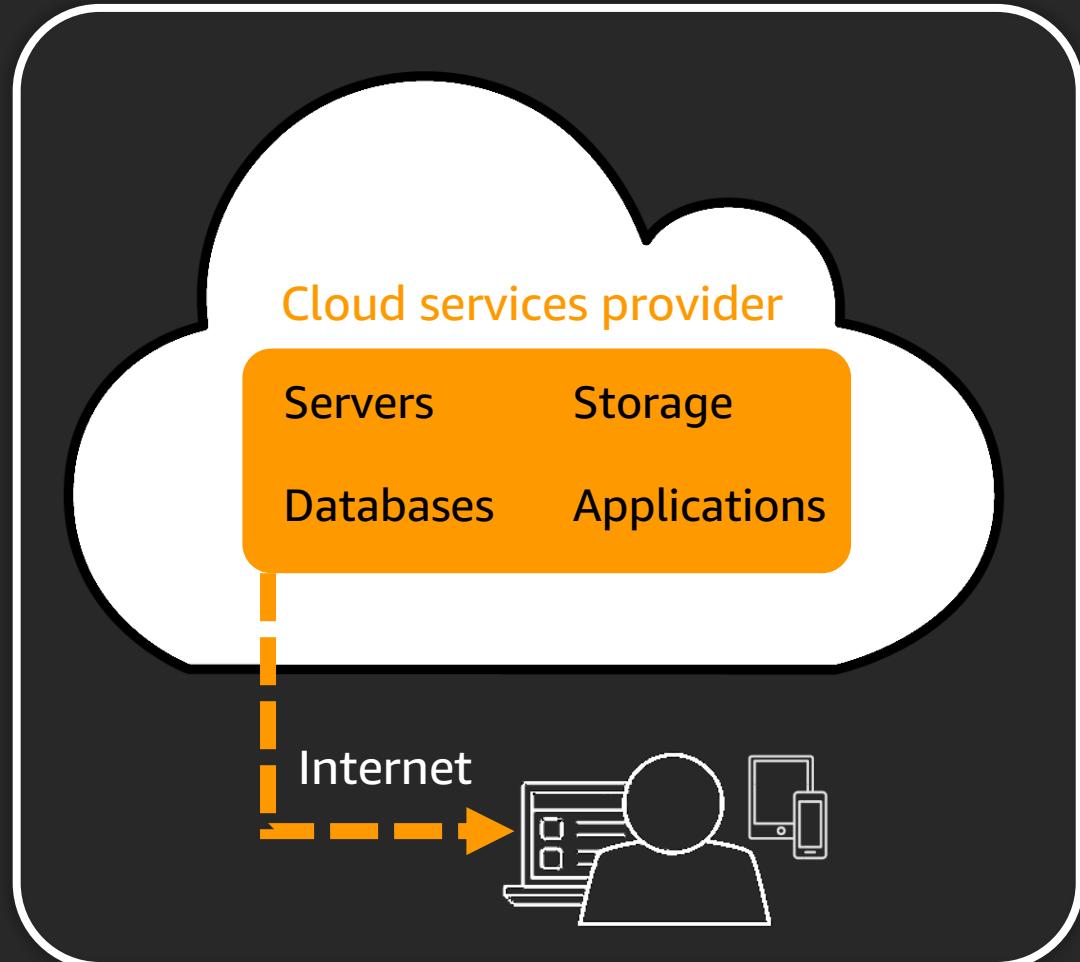
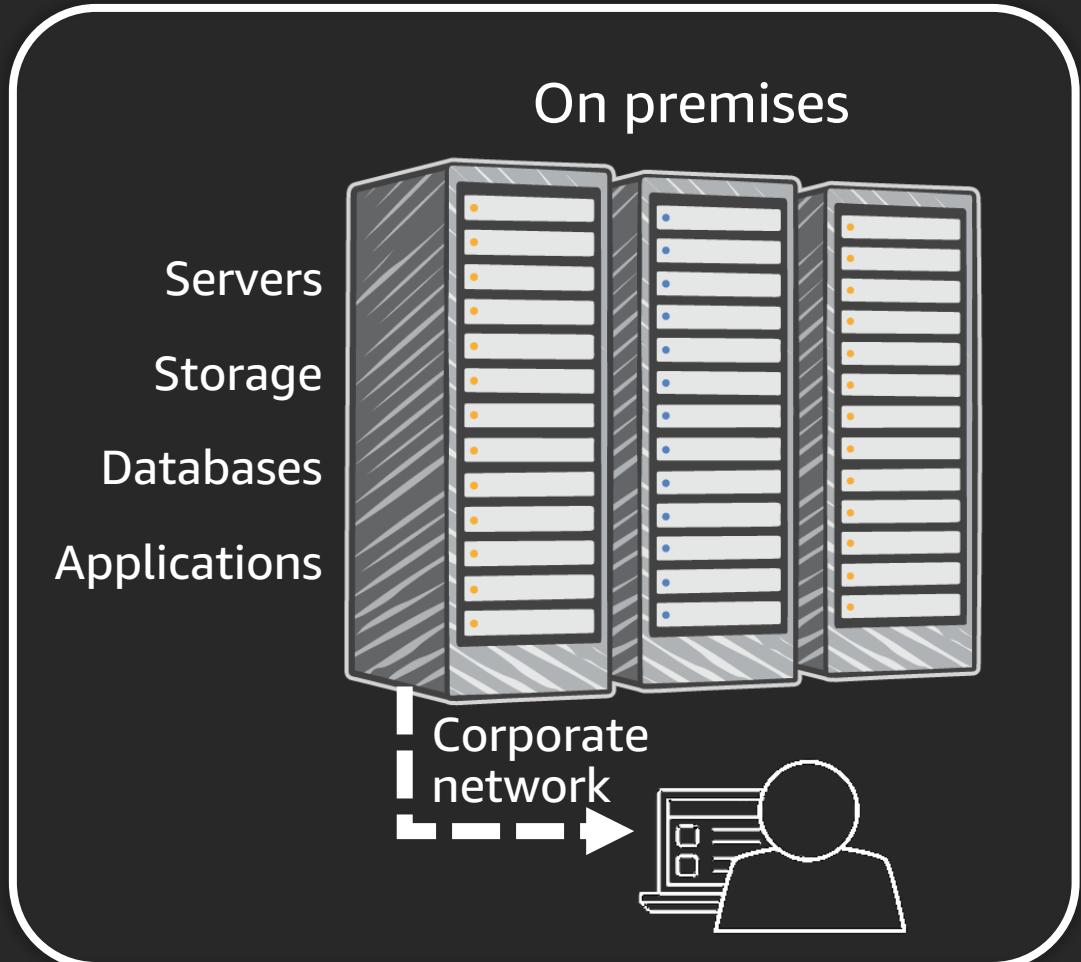


Stop guessing  
capacity

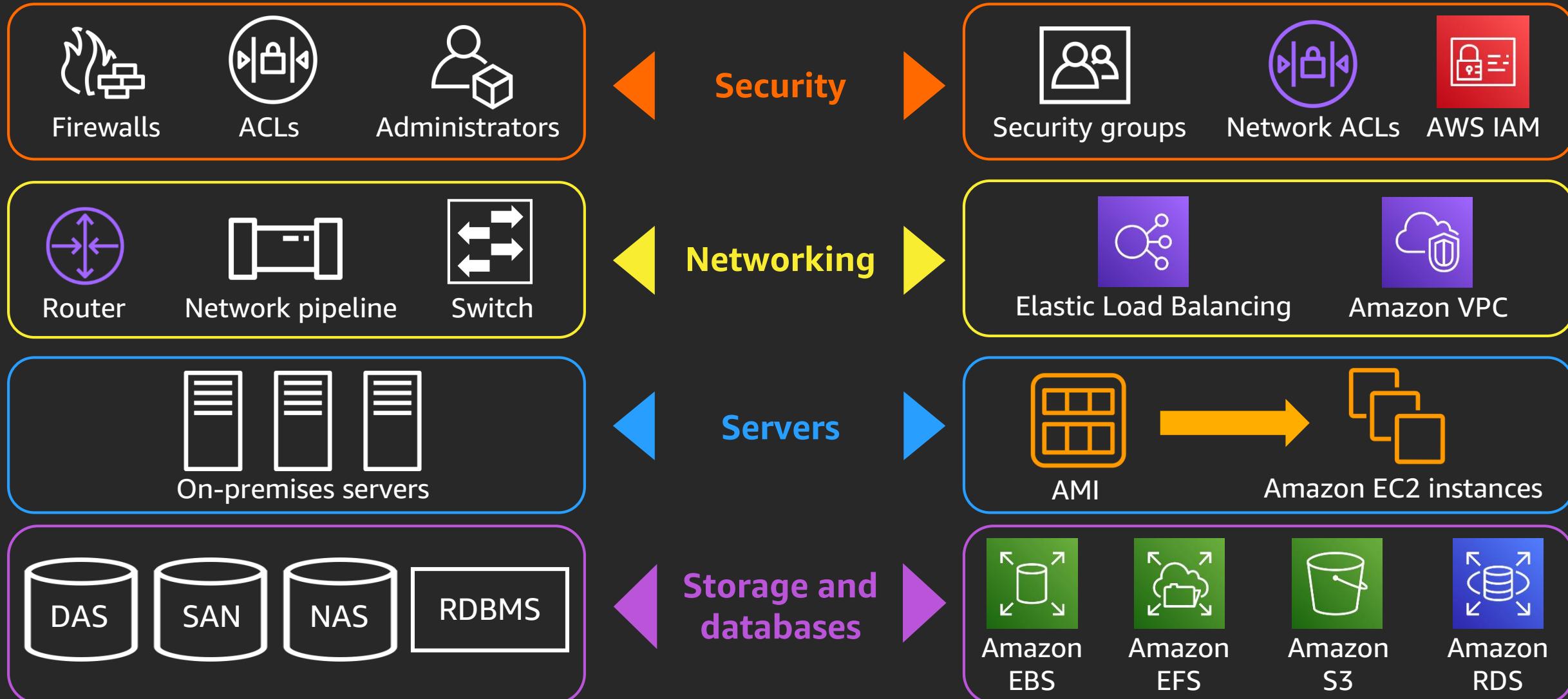


Go global  
in minutes

# A Comparison

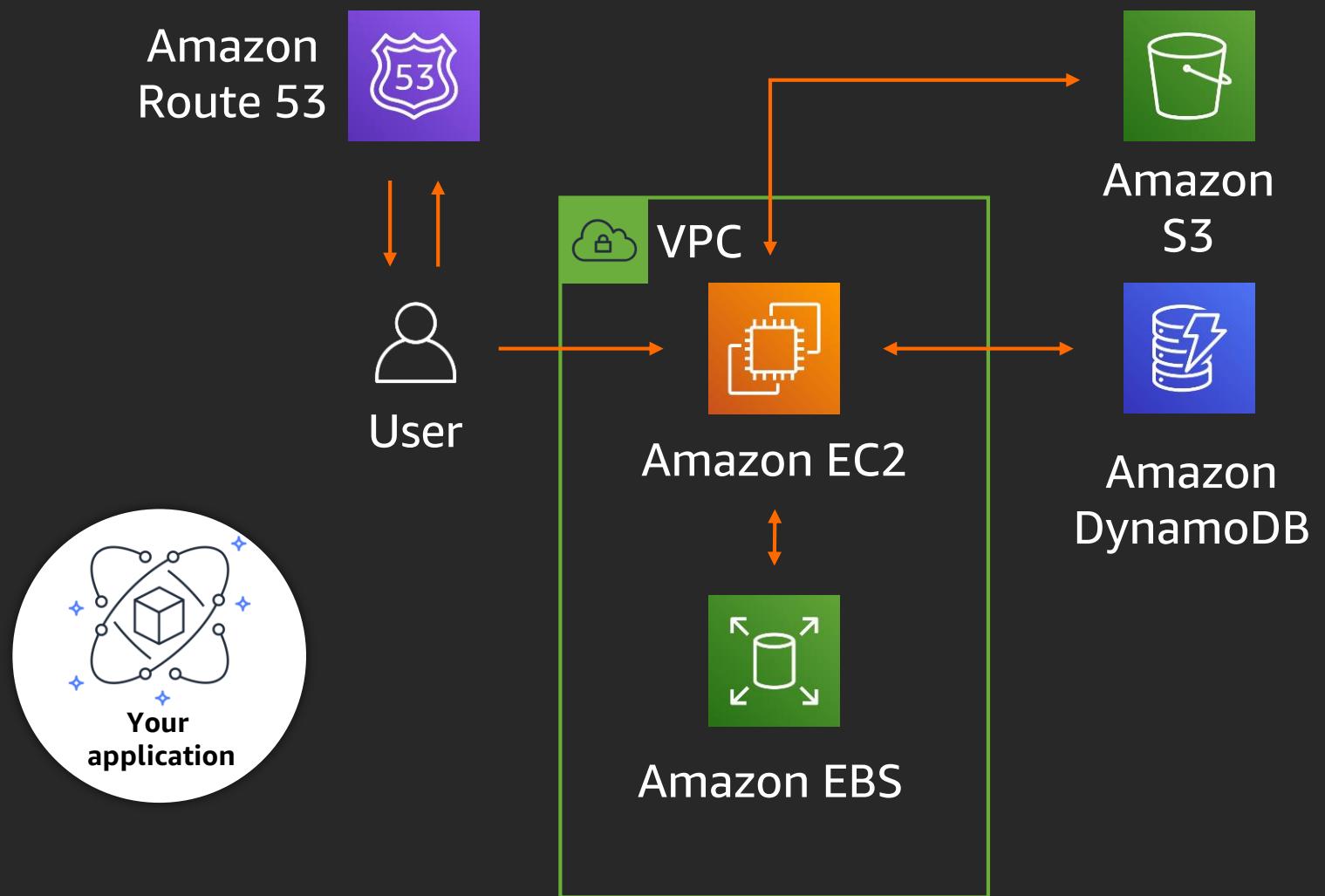


# AWS core infrastructure and services



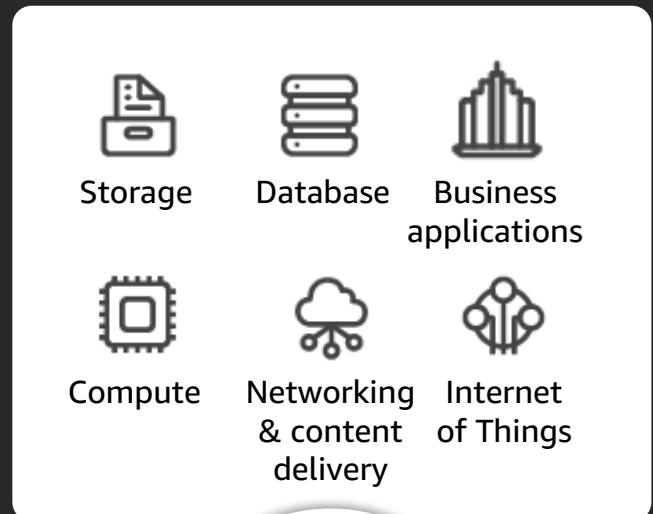
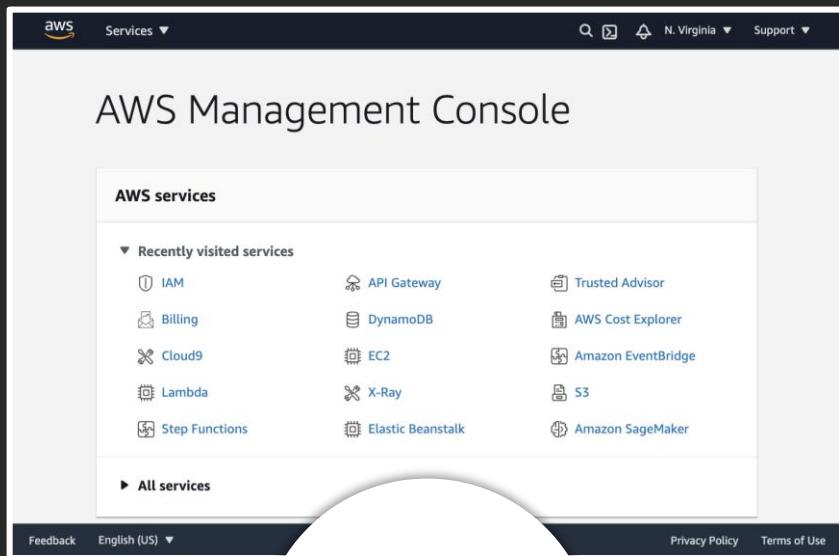
# Key service areas

- Compute
- Storage
- Databases
- Networking
- Security



# How does it work?

- AWS owns and maintains the network-connected hardware
- You provision and use what you need



# Cloud deployment models

On premises



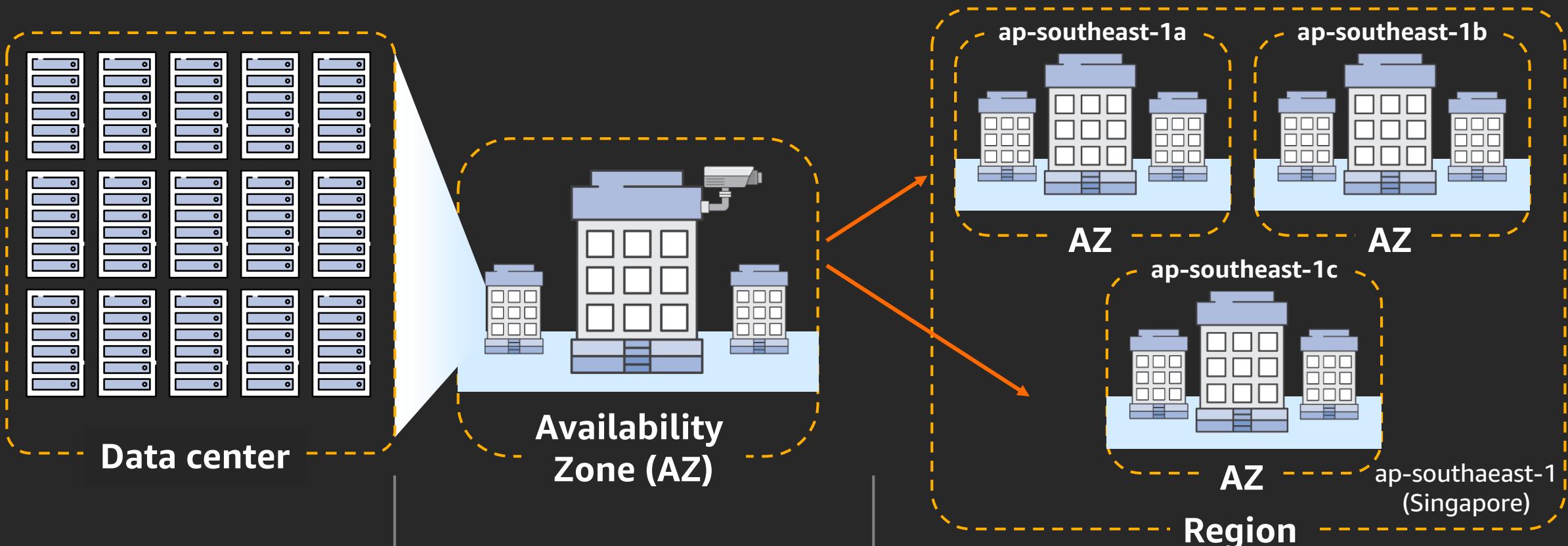
Hybrid



Cloud



# AWS global infrastructure

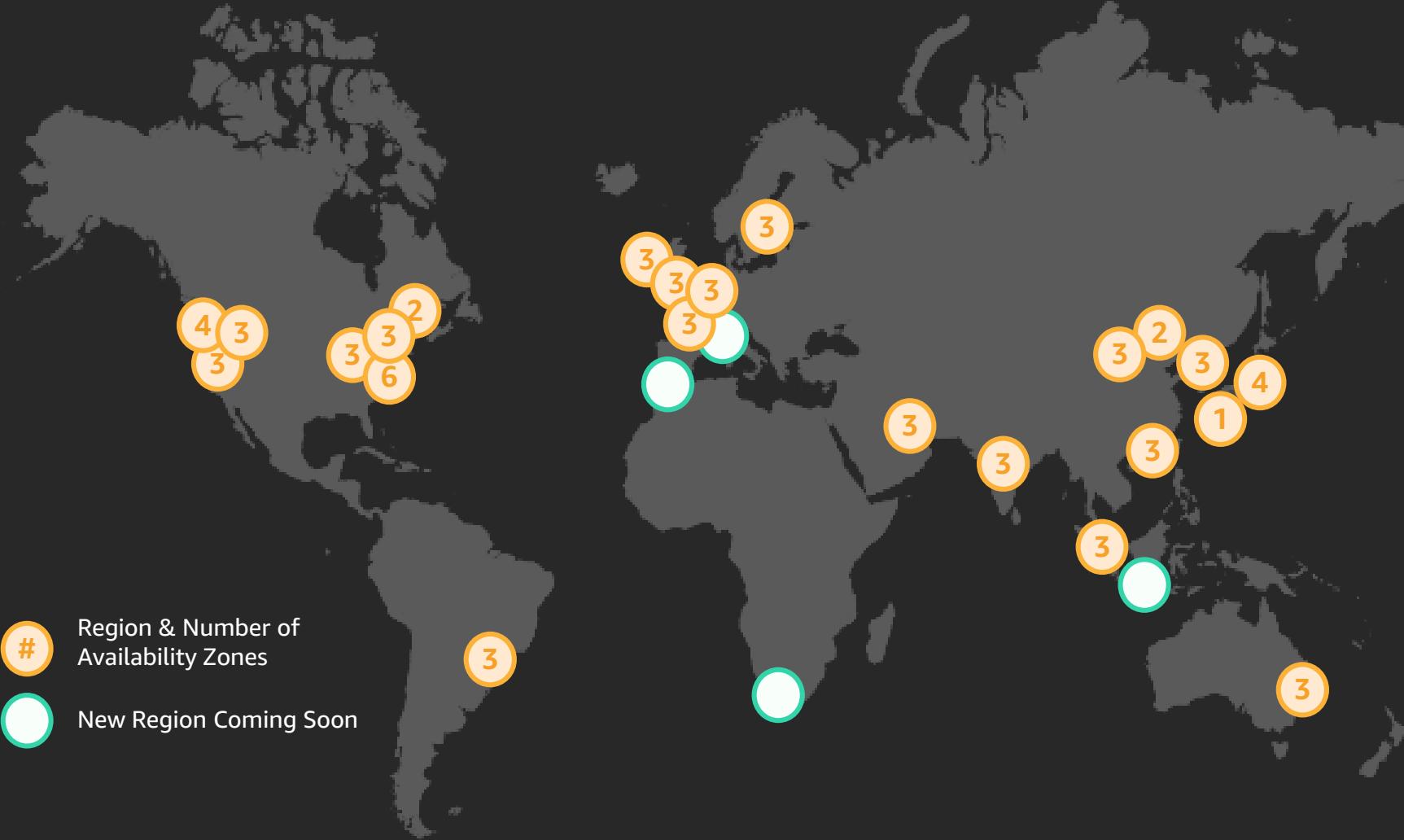


Typically houses  
thousands of servers

- One or more data centers
- Designed for **fault isolation**

- Each AWS Region is made up of **two or more AZs**
- AWS has **25 Regions worldwide**

# AWS global infrastructure: Current Regions



## Choose a Region

- Data governance
- Latency
- Cost

## Edge infrastructure

- Amazon CloudFront (content delivery network)
- AWS Outposts
- Local Zones
- AWS Wavelength

# AWS edge infrastructure

MOVING THE CLOUD CLOSER TO THE ENDPOINT

## AWS Outposts



### Overview

AWS infrastructure and services **on premises**

### Use cases

Migration, local critical applications, data residency

### Service model

Expandable capacity in customer's data center, colocation, on-premises location

## AWS Local Zones



AWS infrastructure and services **in large metro centers**

Migration, low latency, local data processing

Scalable capacity in AWS-managed & operated facility

## AWS Wavelength



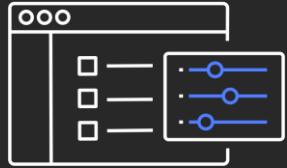
AWS infrastructure and services **in CSP 5G networks**

Ultra-low latency, local data processing

Scalable capacity in CSP data center managed and supported by AWS

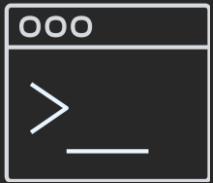
**More on this later!**

# Three ways to interact with AWS



## AWS Management Console

Easy-to-use graphical interface



## AWS Command Line Interface (AWS CLI)

Access to services by discrete command

```
$ aws s3 ls
```



## Software development kits (SDKs)

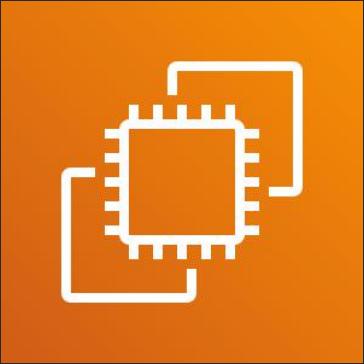
Access services in your code



# Compute



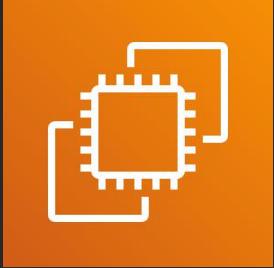
# Amazon Elastic Compute Cloud (Amazon EC2)



Amazon  
EC2

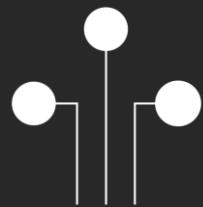
- Resizable compute capacity
- Complete control of your computing resources
- Reduced time required to obtain and boot new server instances

# Virtual machines vs. physical servers



Amazon EC2 can solve some problems that are more difficult with an on-premises server

When using disposable resources



Data-driven decisions



Quick iterations

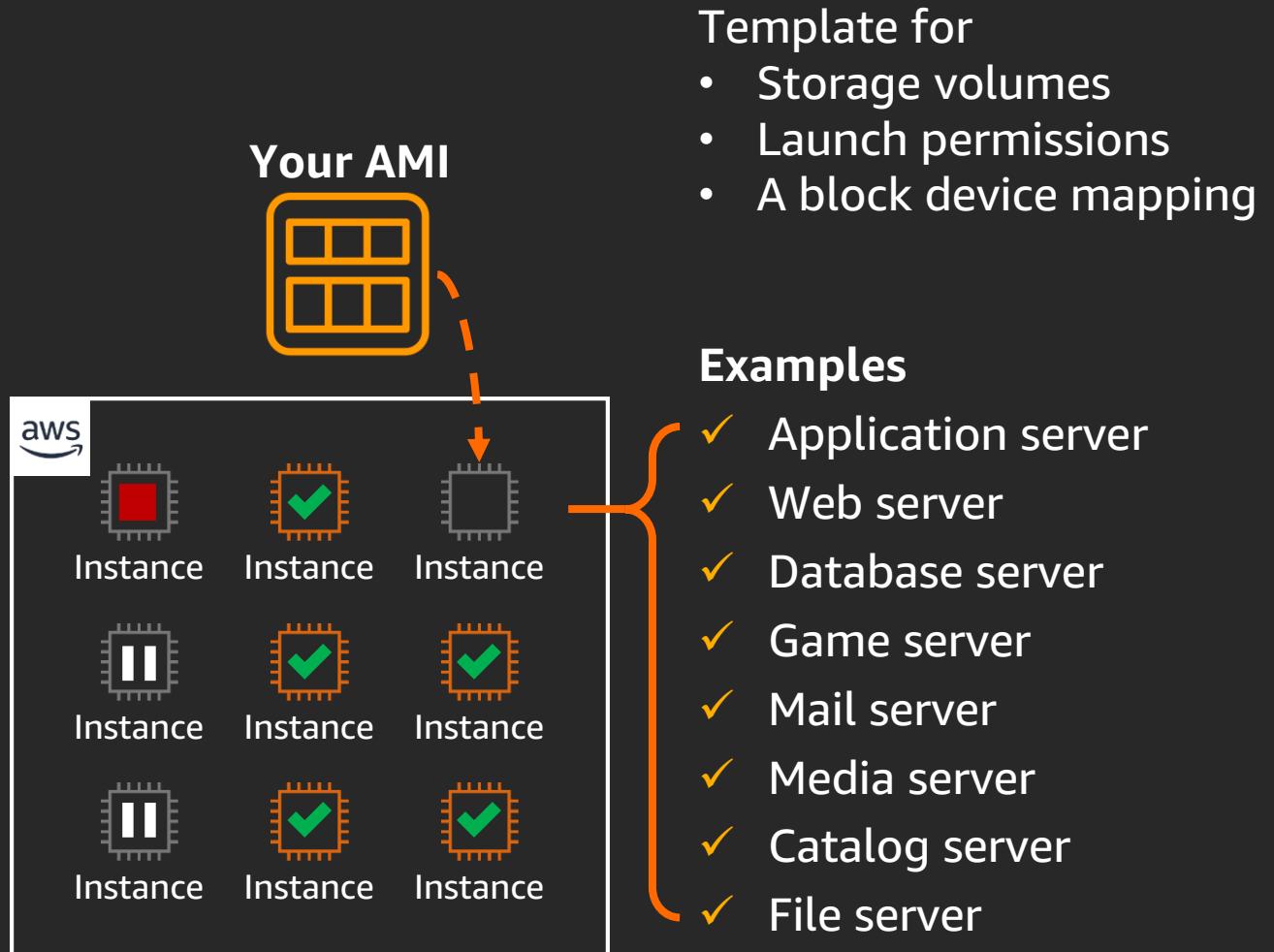


Free to make mistakes

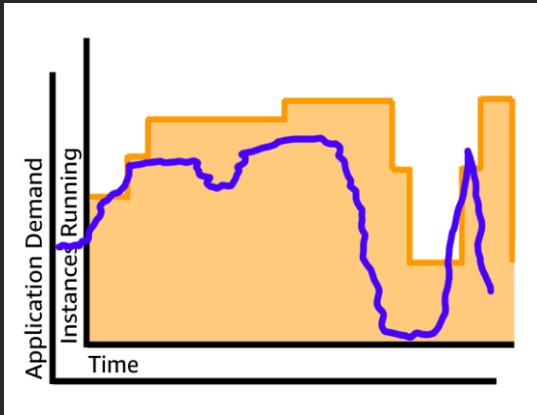
# Amazon EC2

Amazon EC2 provides pay-as-you-go pricing and a broad selection of hardware and software

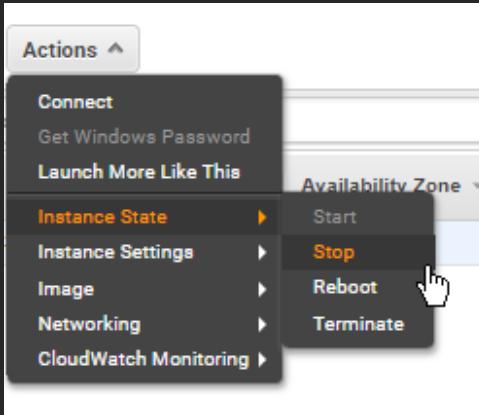
- Use Amazon Machine Images (AMIs)
- Add or terminate instances as needed
- Pause and resume your instances



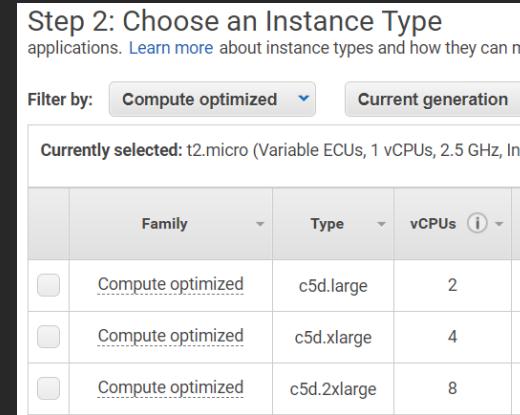
# Benefits of Amazon EC2



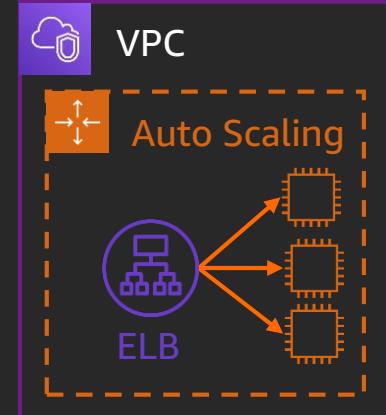
Elasticity



Control



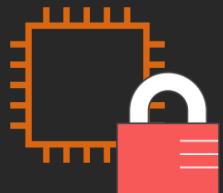
Flexibility



Integrated



Reliable



Secure



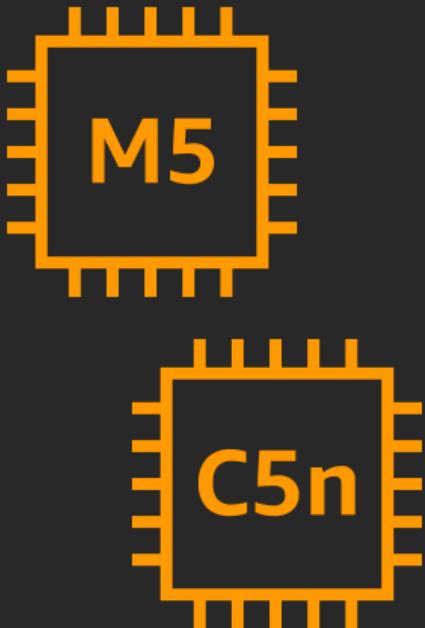
Inexpensive



Easy

# Amazon EC2 instance families and names

Choosing the correct type is very important for  
**efficient use of your instances and cost reduction**



Instance family	Use cases
<b>General purpose</b> e.g., A1, T3, T3a, T2, M6g, M5	<ul style="list-style-type: none"><li>Low-traffic websites and web applications</li><li>Small databases and midsize databases</li></ul>
<b>Compute optimized</b> e.g., C5, C5n, C4	<ul style="list-style-type: none"><li>High-performance web servers</li><li>Video encoding</li></ul>
<b>Memory optimized</b> e.g., R5, R5n, X1e, X1, z1d	<ul style="list-style-type: none"><li>High-performance databases</li><li>Distributed memory caches</li></ul>
<b>Storage optimized</b> e.g., I3, I3en, D2, H1	<ul style="list-style-type: none"><li>Data warehousing</li><li>Log or data processing applications</li></ul>
<b>Accelerated computing</b> e.g., P3, P2, Inf1, G4, G3, F1	<ul style="list-style-type: none"><li>3D visualizations</li><li>Machine learning</li></ul>

# Amazon EC2 pricing

On-Demand  
Instances

Reserved  
Instances

Savings  
Plans

Spot  
Instances

- Per-second billing (Amazon Linux and Ubuntu only)
- Per-hour billing (all other OS)

# Unmanaged vs. managed services



## Unmanaged

You manage scaling, fault tolerance, and availability

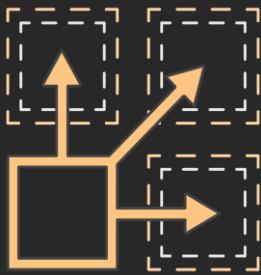


## Managed

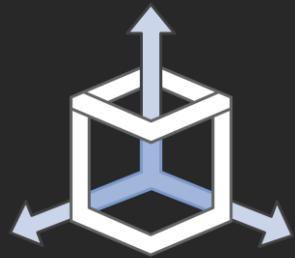
Scaling, fault tolerance, and availability are typically built in to the service

# What is serverless computing?

Building and running applications and services without managing servers



No servers to provision or manage



Scales with usage

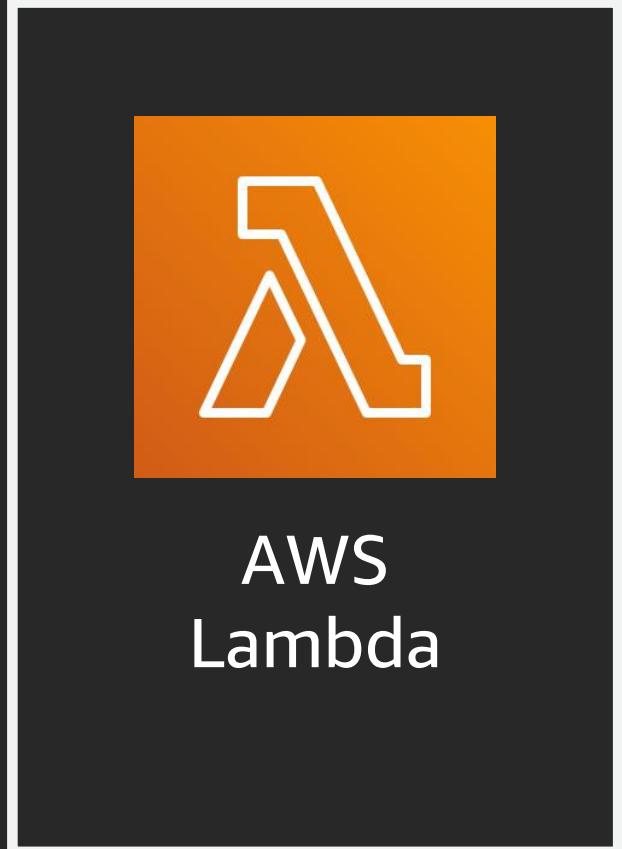


Never pay for idle



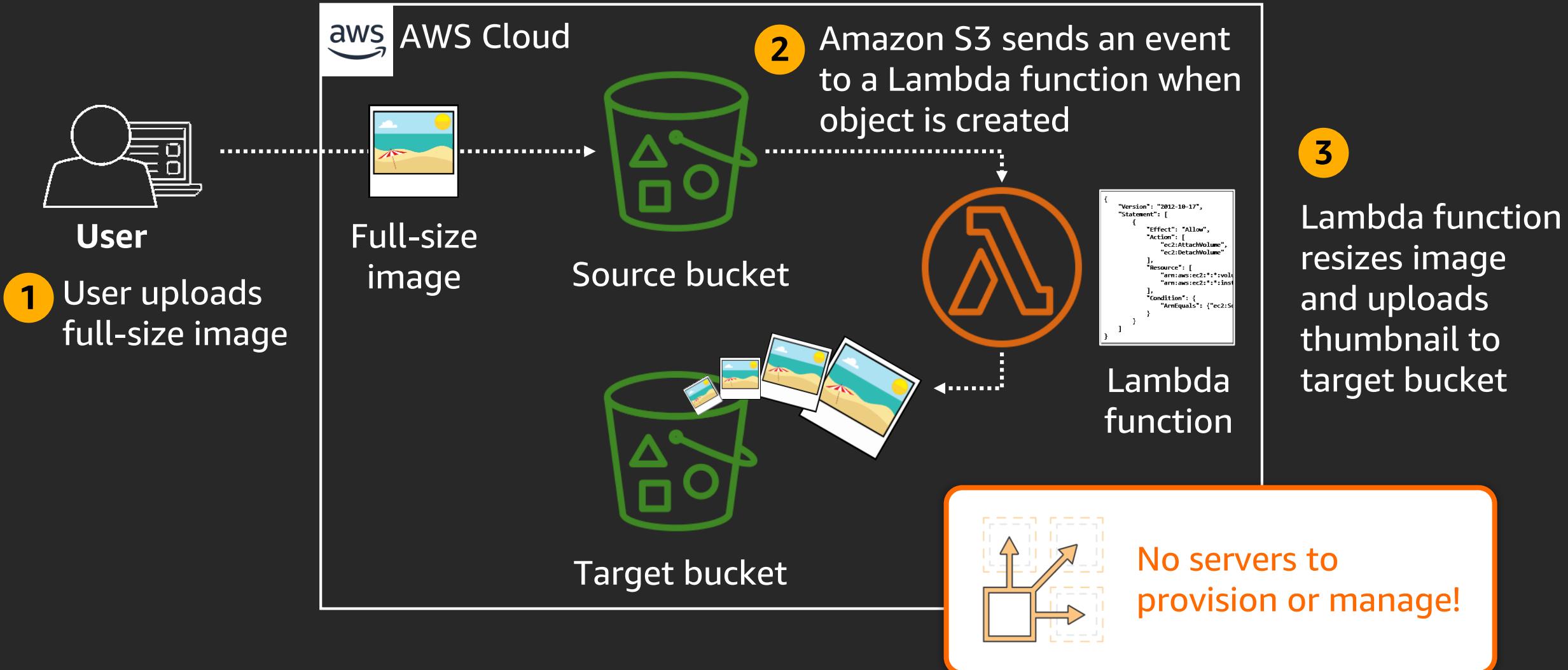
Availability and fault tolerance built in

# AWS Lambda

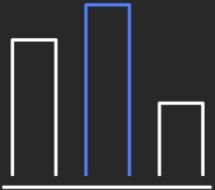
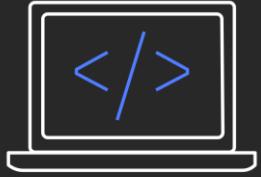


- Fully managed compute service
- Runs stateless code
- Supports multiple languages
- Runs your code on a schedule or in response to events (e.g., changes to data in an Amazon S3 bucket or Amazon DynamoDB table)

# Lambda example: Create thumbnails



# Serverless application use cases



## Web applications

Static websites

Complex web applications

Packages for Flask and Express

## Backends

Applications and services

Mobile

IoT

## Data processing

Real time

MapReduce

Batch

Machine learning inference

## Chatbots

Powering chatbot logic

## Amazon Alexa

Powering voice-enabled applications

Alexa Skills Kit

## IT automation

Policy engines

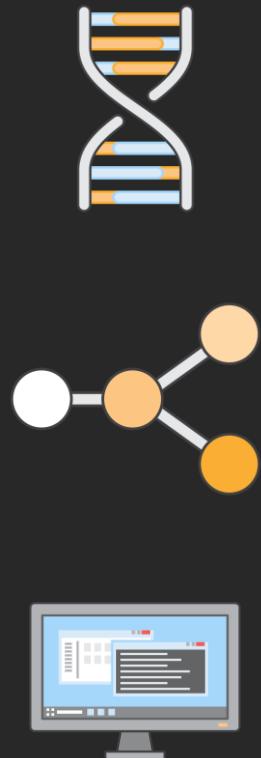
Extending AWS services

Infrastructure management

# Amazon Elastic Container Service (Amazon ECS)



Amazon  
ECS

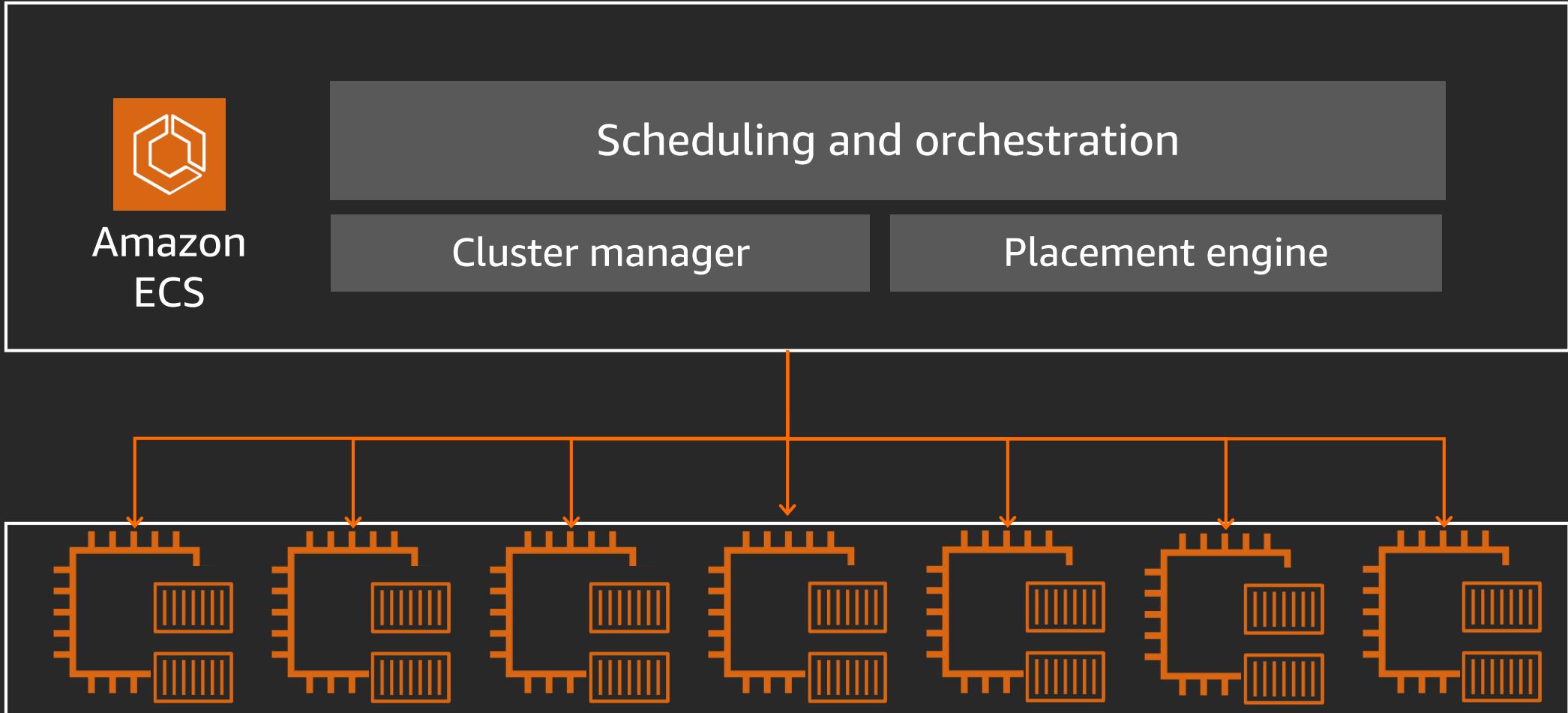


Orchestrates the execution of containers

Maintains and scales the fleet of nodes  
running your containers

Removes the complexity of standing up  
the infrastructure

# Amazon ECS



# Knowledge check

Which of the following is not a feature of Amazon EC2?

- A. Broad selection of instance types for different workloads
- B. Fully managed compute service
- C. Multiple pricing options and per-second billing
- D. Complete control over instance and remote access options
- E. Reusable templates for launching additional instances (AMIs)

# Knowledge check

Which of the following is not a feature of Amazon EC2?

- A. ~~Broad selection of instance types for different workloads~~
- B. **Fully managed compute service (Lambda)**
- C. ~~Multiple pricing options and per-second billing~~
- D. ~~Complete control over instance and remote access options~~
- E. ~~Reusable templates for launching additional instances (AMIs)~~

**Answer: B**

# Storage



# AWS storage options



## Amazon S3

Scalable, highly durable object storage in the cloud



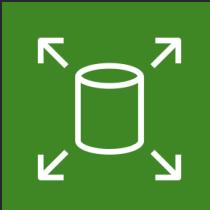
## AWS Storage Gateway

Hybrid cloud storage service that gives you on-premises access to virtually unlimited cloud storage.



## Amazon S3 Glacier

Low-cost, highly durable archive storage in the cloud



## Amazon EBS

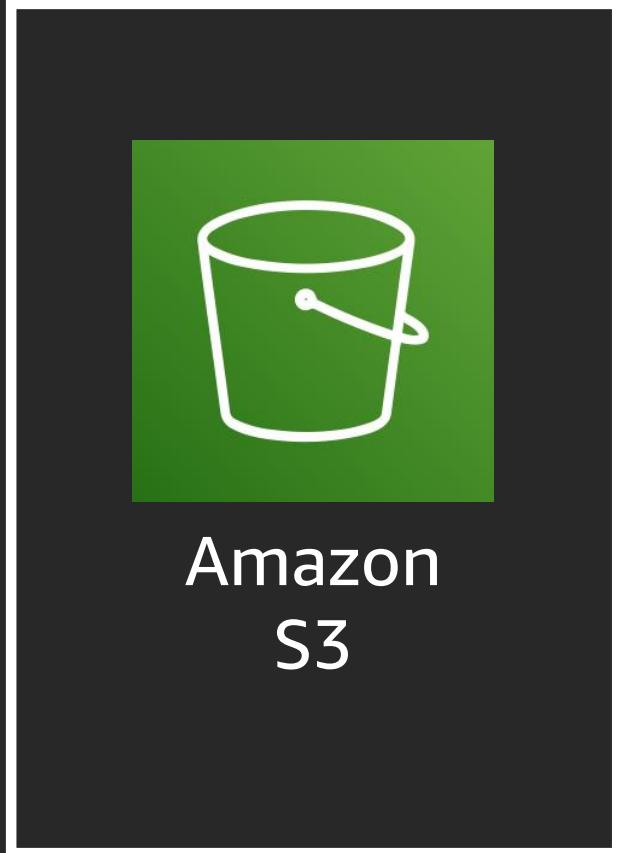
Network-attached volumes that provide durable block-level storage for Amazon EC2 instances



## Amazon EFS

Scalable network file storage for Amazon EC2 instances

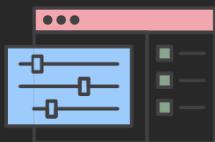
# Amazon S3



Object-level  
storage



Designed for  
99.99999999%  
durability



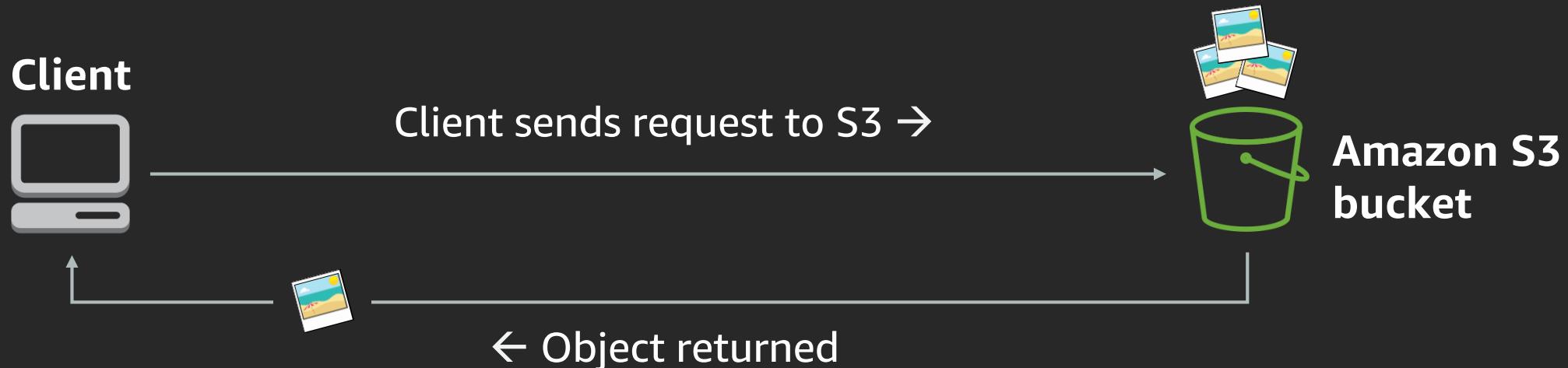
Event triggers

## Use cases

- Content storage and distribution
- Backup and archiving
- Big data analytics
- Disaster recovery
- Static website hosting

# Amazon S3

- Built to **store and retrieve** data
- Fast, durable, **highly available access** to objects
- Can store an **unlimited number of objects** in a bucket
- Store and retrieve data at any time, from **anywhere on the web**



# Choosing a Region

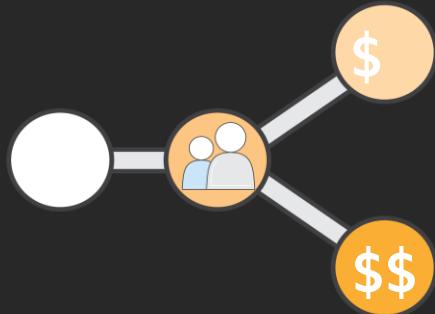
## Data residency regulatory compliance



Are there relevant Region data privacy laws?

Can customer data be stored outside the country?

## Proximity of users to data



Small differences in latency can impact customer experience

Choose the Region closest to your users

## Cost-effectiveness



Costs vary by Region

Evaluate cost-effectiveness of replicating data to another Region

# Amazon S3 Glacier



Amazon  
S3 Glacier



Long-term  
data storage



Archival &  
backup



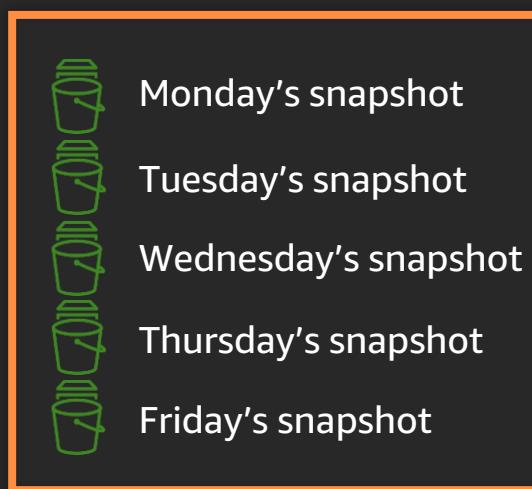
Very low-cost  
storage

## Use cases

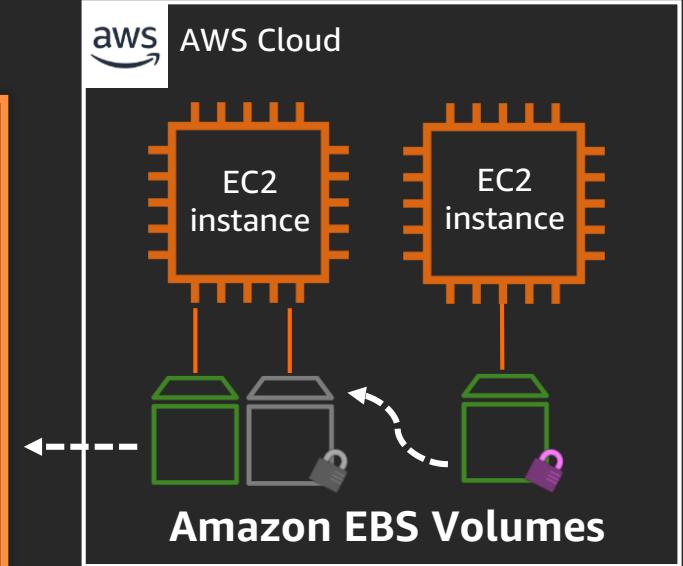
- Media asset workflows
- Healthcare information archiving
- Regulatory and compliance archiving
- Scientific data storage
- Digital preservation
- Magnetic tape replacement

# Amazon Elastic Block Store (Amazon EBS)

- Persistent block storage for instances
- Protected through replication
- Different drive types
- Scale up or down in minutes
- Pay for only what you provision
- Snapshot functionality
- Encryption available



Create volume snapshots for backup and recovery



Detach and reattach volumes to other EC2 instances

# Knowledge check

Which of the following services offers object-based storage?

- A. Amazon Elastic Block Store (Amazon EBS)
- B. AWS Storage Gateway
- C. Amazon Elastic File System (Amazon EFS)
- D. Amazon S3
- E. Amazon Machine Images (AMIs)

# Knowledge check

Which of the following services offers object-based storage?

- A. ~~Amazon Elastic Block Store (Amazon EBS)~~
- B. ~~AWS Storage Gateway~~
- C. ~~Amazon Elastic File System (Amazon EFS)~~
- D. **Amazon S3**
- E. ~~Amazon Machine Images (AMIs)~~

**Answer: D**

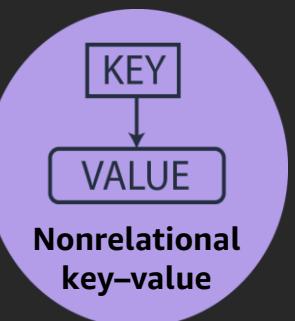
# Databases



# Purpose-built databases



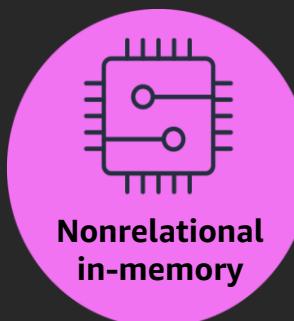
Relational  
database



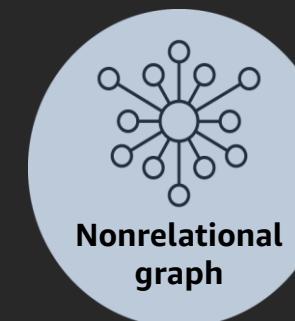
Nonrelational  
key-value



Nonrelational  
document



Nonrelational  
in-memory



Nonrelational  
graph



Nonrelational  
ledger



Amazon  
RDS



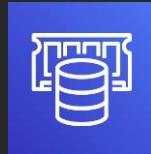
Amazon  
Aurora



Amazon  
DynamoDB



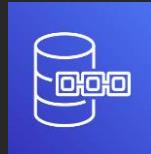
Amazon  
DocumentDB



Amazon  
ElastiCache



Amazon  
Neptune

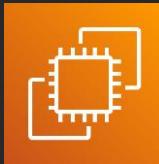


Amazon  
QLDB



Amazon  
Redshift

# DIY vs. AWS database services



## Databases on Amazon EC2

- Operating system access
- Need features of specific application



## AWS database services

- Easy to set up, manage, maintain
- Push-button high availability
- Focus on performance
- Managed infrastructure

# AWS database options

	SQL	NoSQL
Transactional databases	 Amazon RDS	 Amazon DynamoDB
Data analytics or relationships	 Amazon Redshift	 Amazon Neptune
In-memory data store and cache		 Amazon ElastiCache

# Amazon RDS

Set up, operate, and scale a relational database in the cloud with just a few clicks



Easy to set up  
and operate



Amazon RDS



Scales



Amazon Aurora

Microsoft  
SQL Server



ORACLE

 PostgreSQL

 MySQL

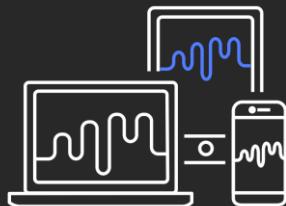
Database engines

# Amazon Aurora

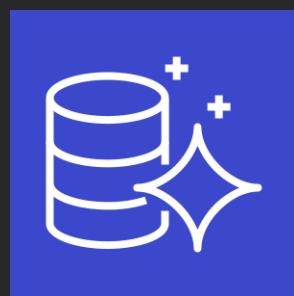
MySQL- and PostgreSQL-compatible relational database built for the cloud



High availability and durability



High performance



Amazon Aurora

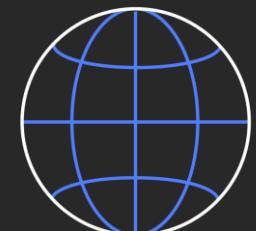
High scalability



Compatible

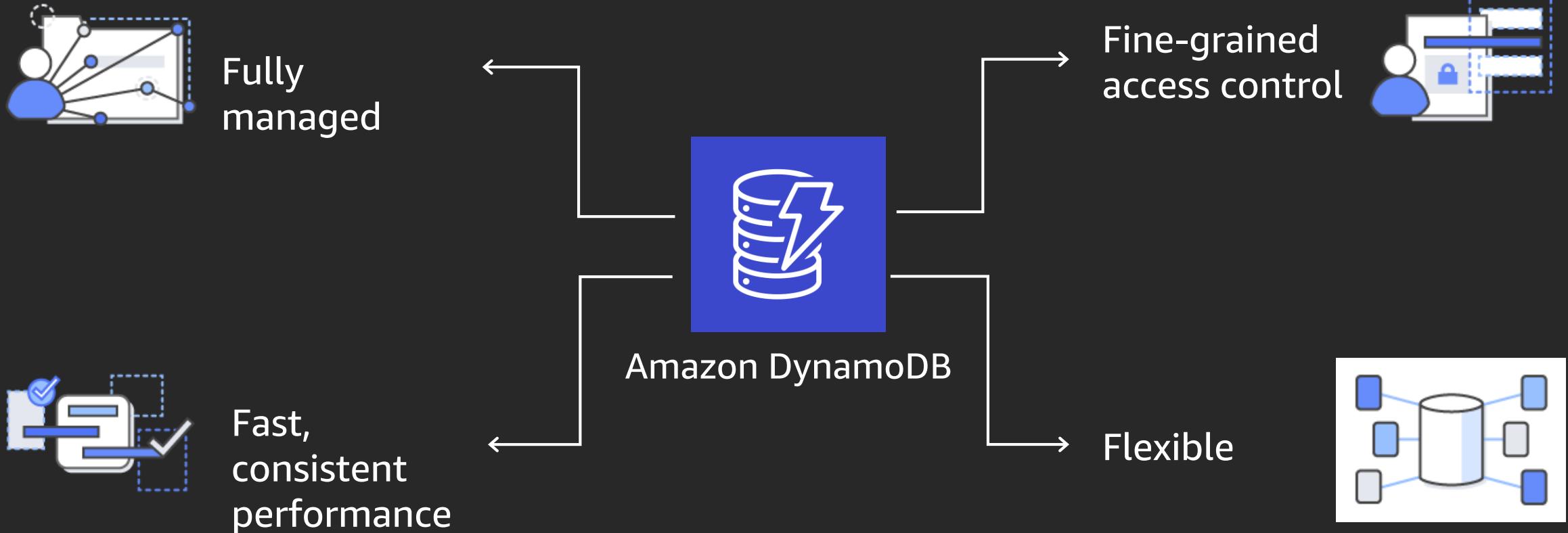


Multi-Region



# Amazon DynamoDB

Fast and flexible NoSQL database service for any scale



# Amazon DynamoDB use cases

**Leaderboards  
and scoring**



GameScores						
UserId	GameTitle	TopScore	TopScoreDateTime	Wins	Losses	
"101"	"Galaxy Invaders"	5842	"2015-09-15:17:24:31"	21	72	...
"101"	"Meteor Blasters"	1000	"2015-10-22:23:18:01"	12	3	...
"101"	"Starship X"	24	"2015-08-31:13:14:21"	4	9	...
"102"	"Alien Adventure"	192	"2015-07-12:11:07:56"	32	192	...
"102"	"Galaxy Invaders"	0	"2015-09-18:07:33:42"	0	5	...
"103"	"Attack Ships"	3	"2015-10-19:01:13:24"	1	8	...
"103"	"Galaxy Invaders"	2317	"2015-09-11:06:53:00"	40	3	...
"103"	"Meteor Blasters"	723	"2015-10-19:01:13:24"	22	12	...
"103"	"Starship X"	42	"2015-07-11:06:53:00"	4	19	...
...	...	...	...	...	...	...

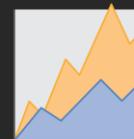
Works well for applications that



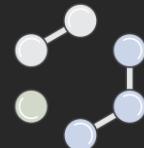
Need extreme horizontal scaling capability



Have simple high-volume data



Need to scale quickly and with ease



Don't need complex joins

# Knowledge check

Which of the following services can be used to deploy NoSQL workloads?

- A. Amazon Aurora
- B. Amazon RDS
- C. Amazon DynamoDB
- D. Amazon Redshift

# Knowledge check

Which of the following services can be used to deploy NoSQL workloads?

- A. ~~Amazon Aurora~~
- B. ~~Amazon RDS~~
- C. **Amazon DynamoDB**
- D. ~~Amazon Redshift~~

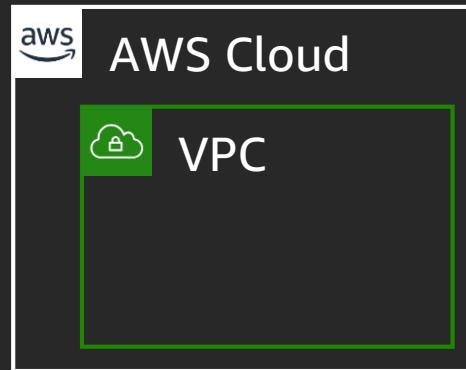
**Answer: C**

# Networking

# Amazon Virtual Private Cloud (Amazon VPC)



Amazon  
VPC



Your private  
network space in  
the AWS Cloud

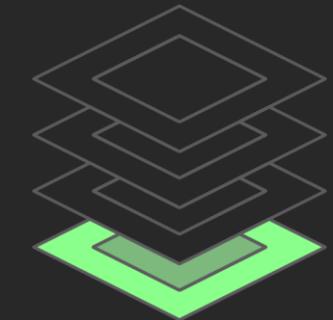
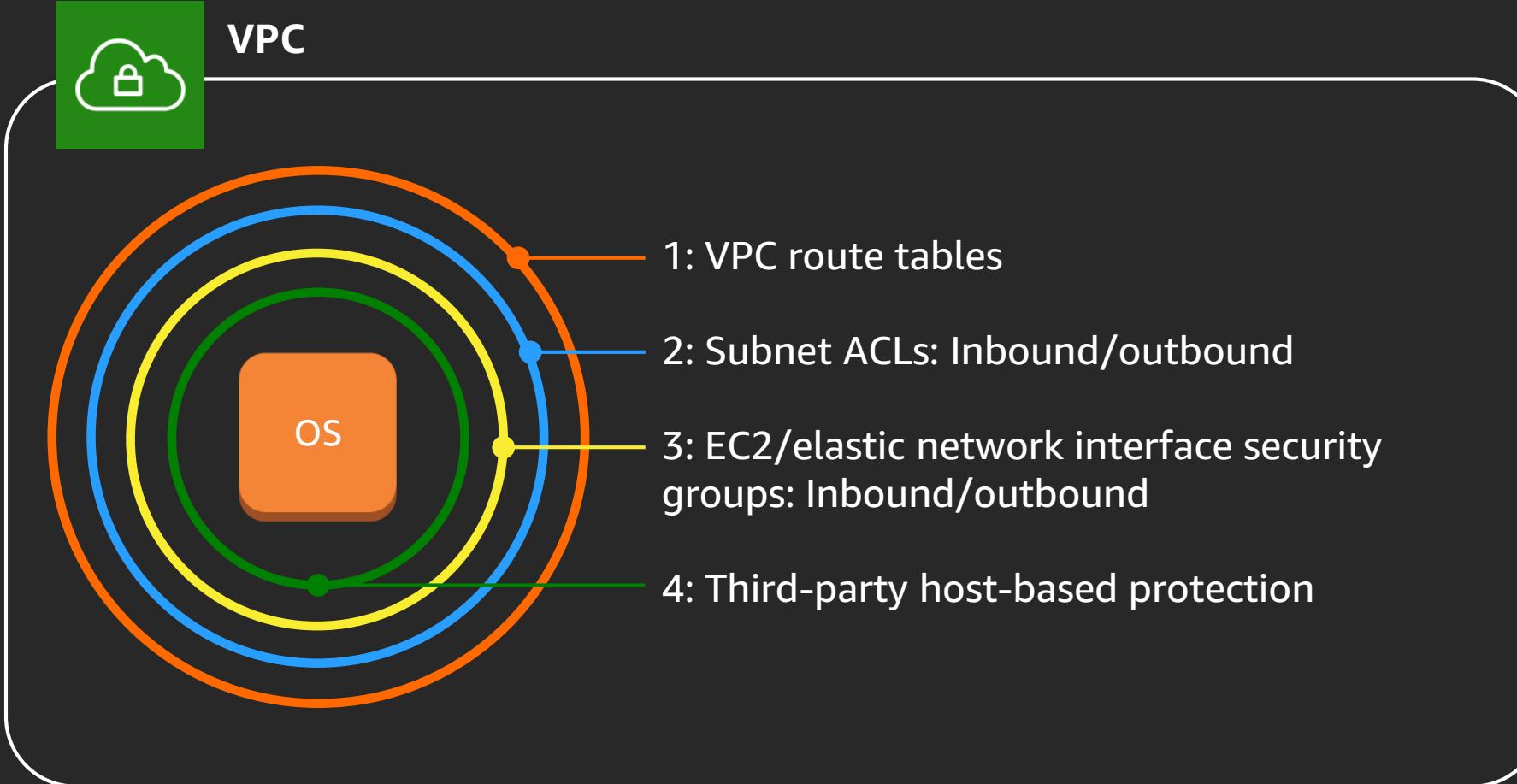


Provides logical  
isolation for  
your workloads



Allows custom access  
controls and security  
settings for your resources

# Layered network defense for VPCs



Security at  
all layers

"Defense in depth"

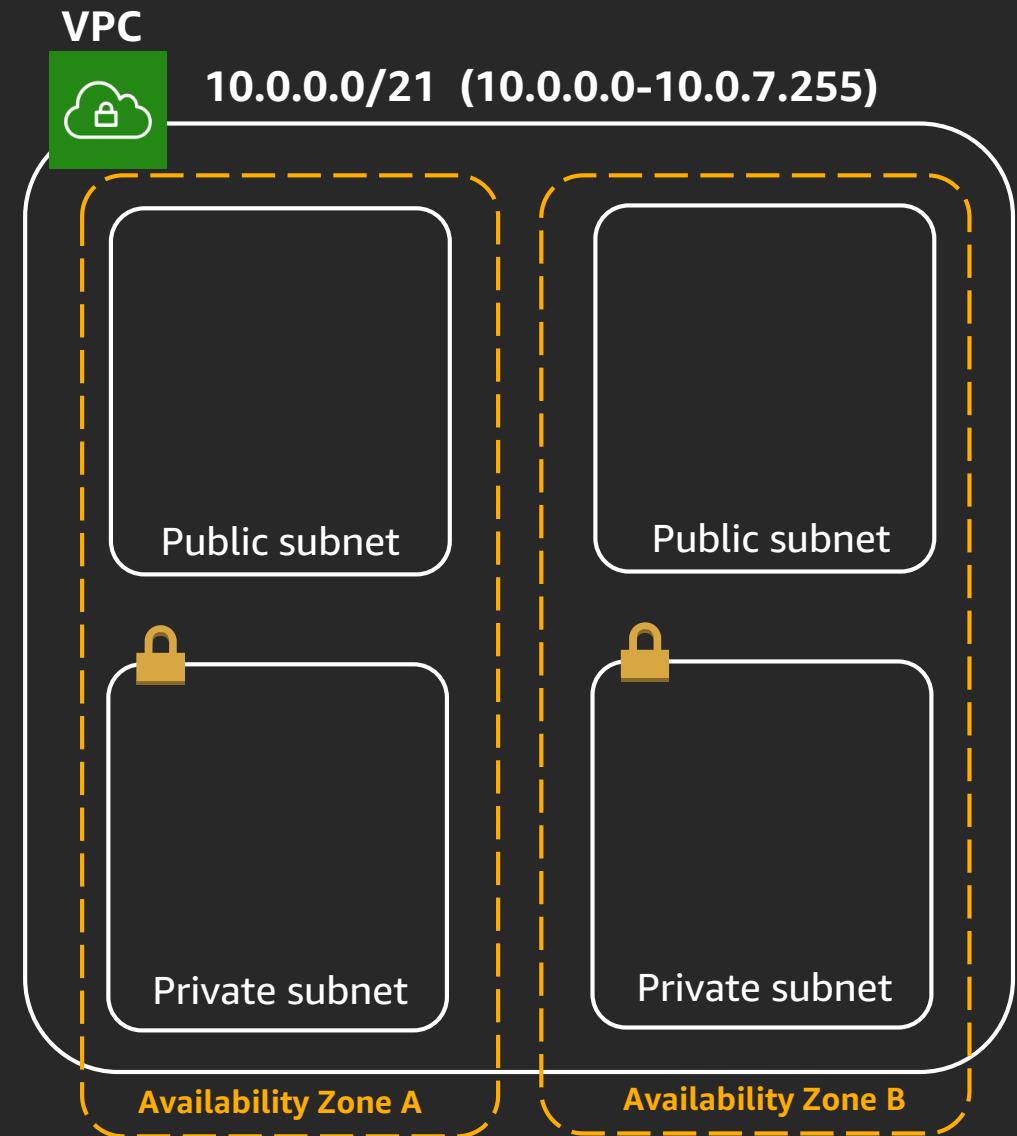
# Using subnets to divide your VPC

A subnet is a segment or partition of a VPC's IP address range where you can isolate a group of resources

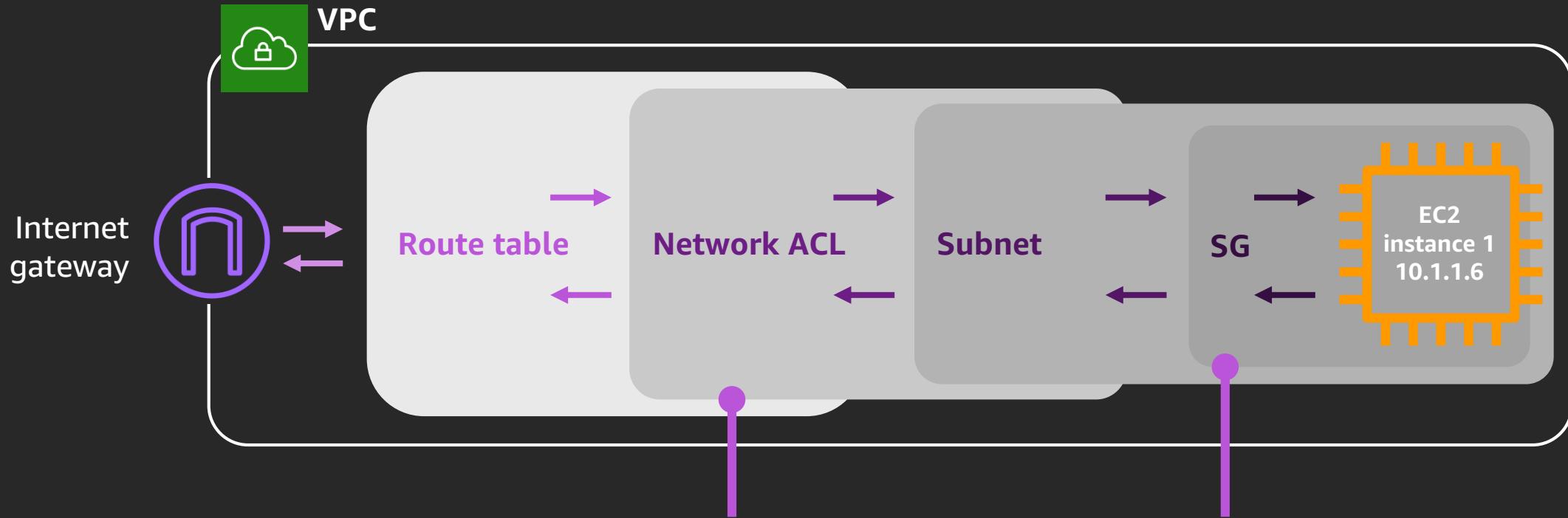
Subnets define internet accessibility

## Private subnets

- No routing table entry to an internet gateway
- Not directly accessible from the public internet



# Structure your infrastructure



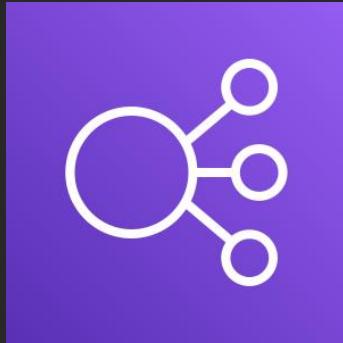
## Network access control lists (ACLs)

- Allow/deny traffic in and out of subnets
- Hardens security as a secondary level of defense at the subnet level

## Security groups

- Used to allow traffic to/from at the network interface (instance) level
- Usually administered by application developers

# Elastic Load Balancing (ELB)



Elastic Load  
Balancing



High  
availability



Health  
checks

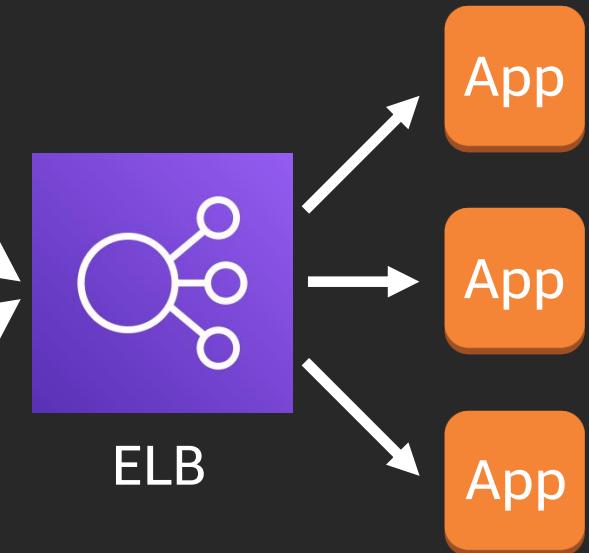


Security  
features

A managed load balancing service that distributes incoming application traffic across multiple Amazon EC2 instances, containers, and IP addresses



User  
traffic



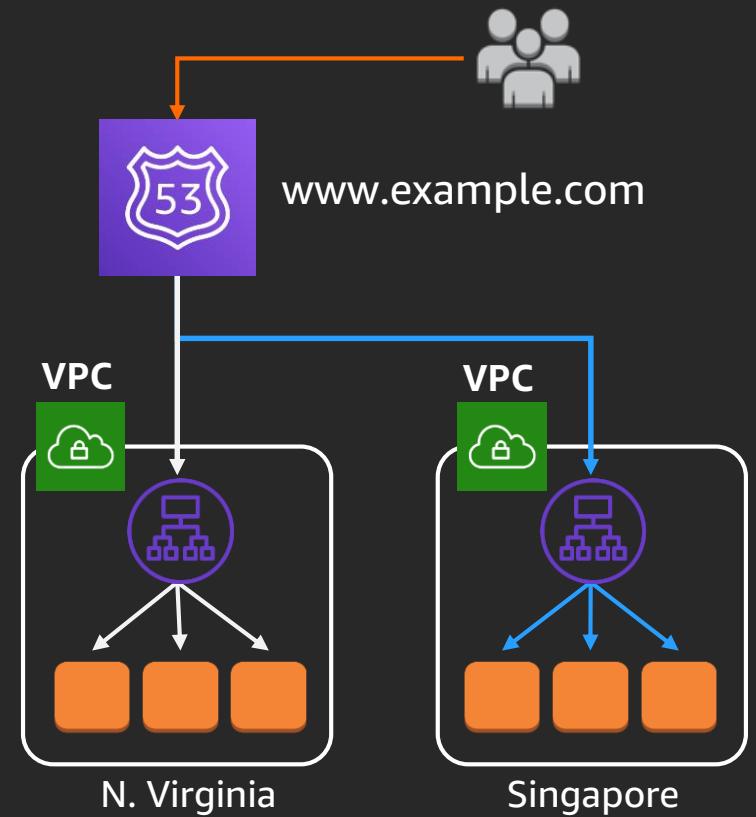
# Amazon Route 53



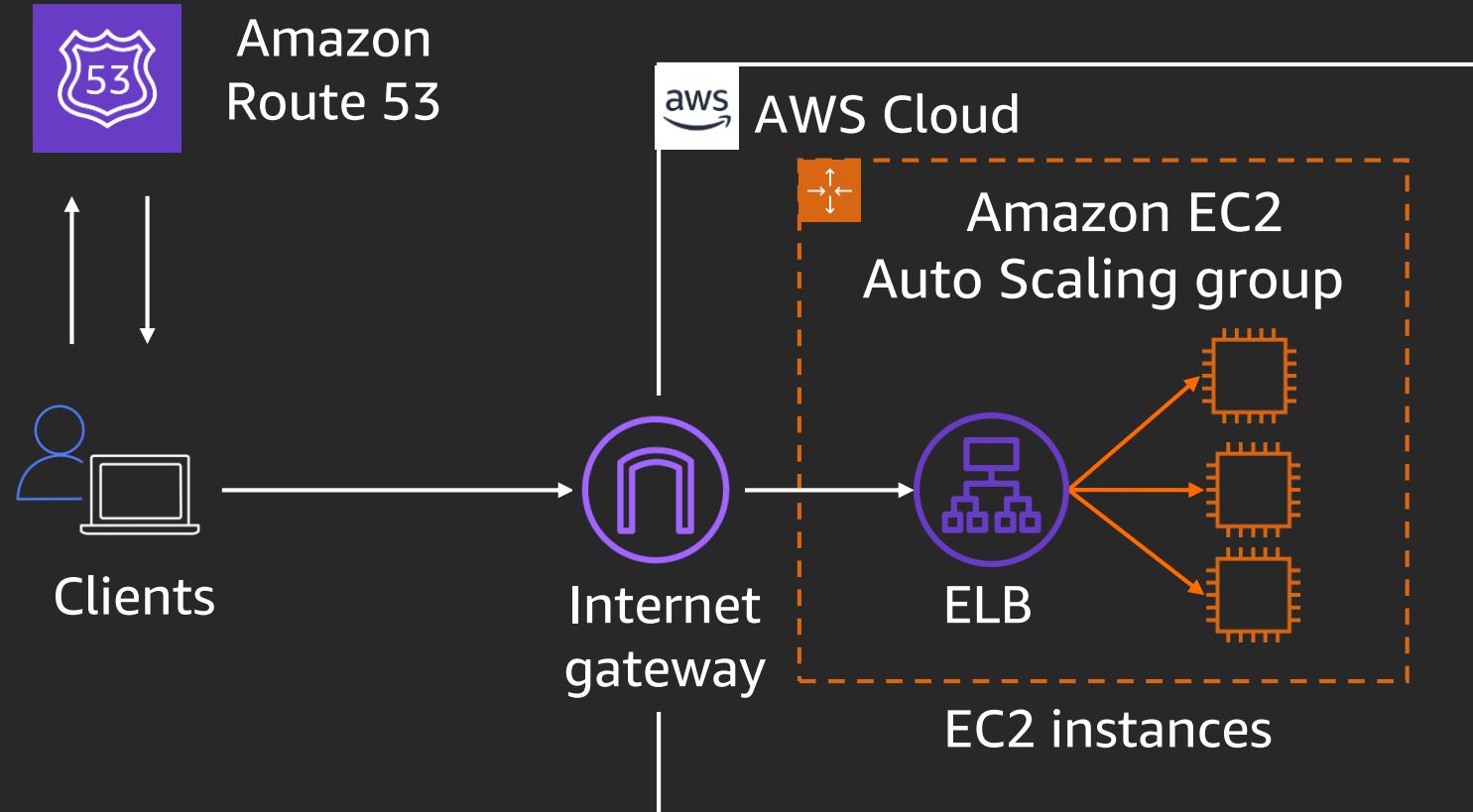
Amazon  
Route 53

Route 53 is a highly available and scalable cloud Domain Name System (DNS) service

- DNS translates domain names into IP addresses
- Able to purchase and manage domain names and automatically configure DNS settings
- Provides tools for flexible, high-performance, highly available architectures on AWS
- Multiple routing options



# Putting it all together



# Knowledge check

Which of the following are layers of network defense for VPCs?  
(choose three)

- A. Amazon Machine Images (AMIs)
- B. Network access control lists (subnet level)
- C. Security groups (instance level)
- D. S3 lifecycle policies
- E. VPC route tables

# Knowledge check

Which of the following are layers of network defense for VPCs?  
(choose three)

- A. ~~Amazon Machine Images (AMIs)~~
- B. Network access control lists (subnet level)
- C. Security groups (instance level)
- D. ~~S3 lifecycle policies~~
- E. VPC route tables

Answer: B, C, E

# Security



# Security is our top priority



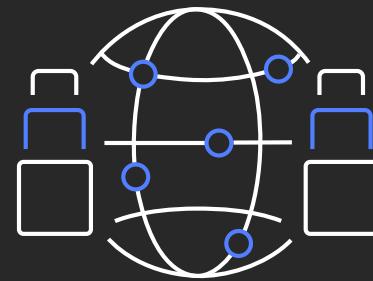
**Designed for  
security**



**Constantly  
monitored**



**Highly  
automated**

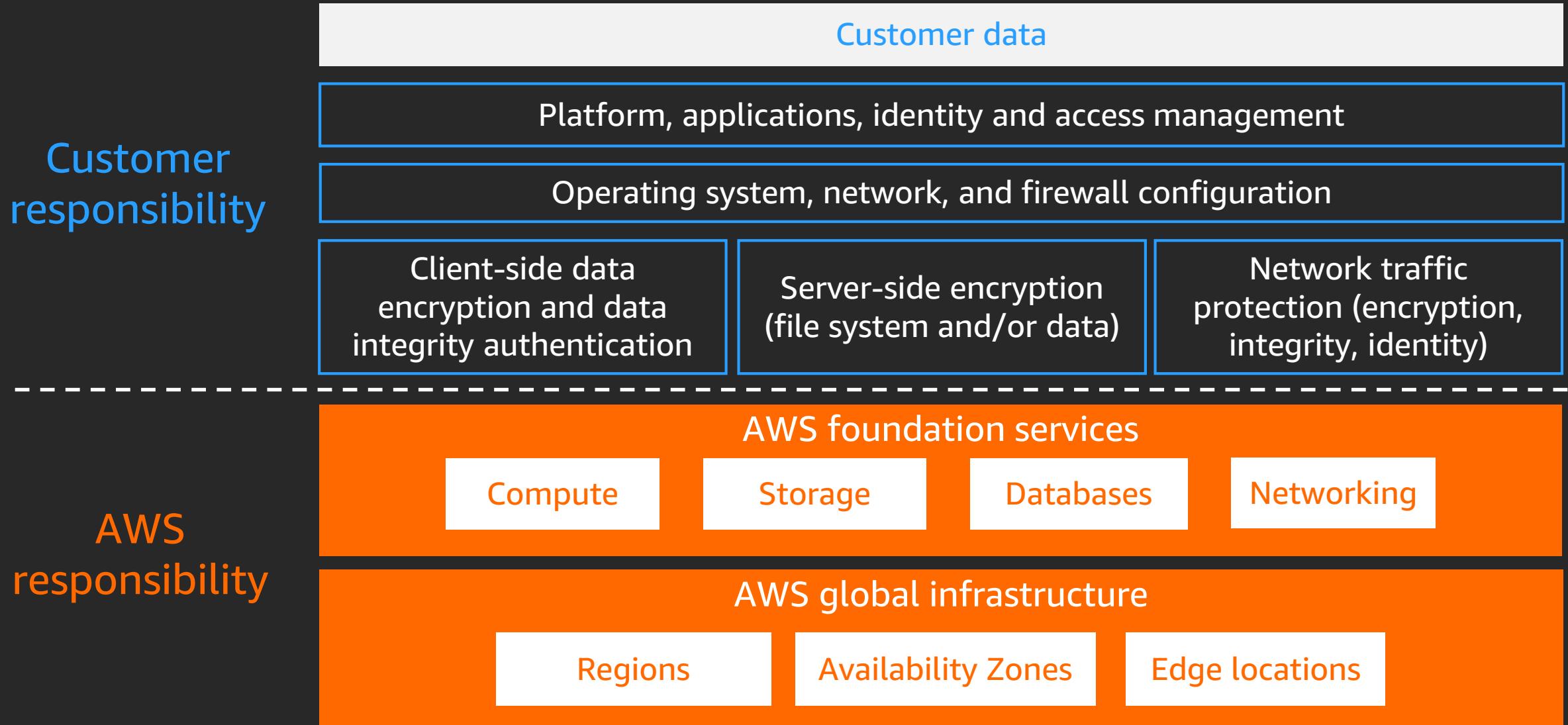


**Highly  
available**

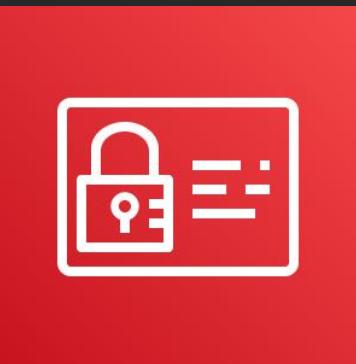


**Highly  
accredited**

# Shared responsibility model



# AWS Identity and Access Management (IAM)



Securely control access to your AWS resources

- Assign granular permissions to users, groups, or roles
- Share temporary access to your AWS account
- Federate users in your corporate network or with an internet identity provider

# IAM components

## Create



### Users

A person or application that interacts with AWS



### Groups

Collection of users with identical permissions



### Roles

Temporary privileges that an entity can assume



## Permissions



## Policies



IAM



# IAM users



IAM user



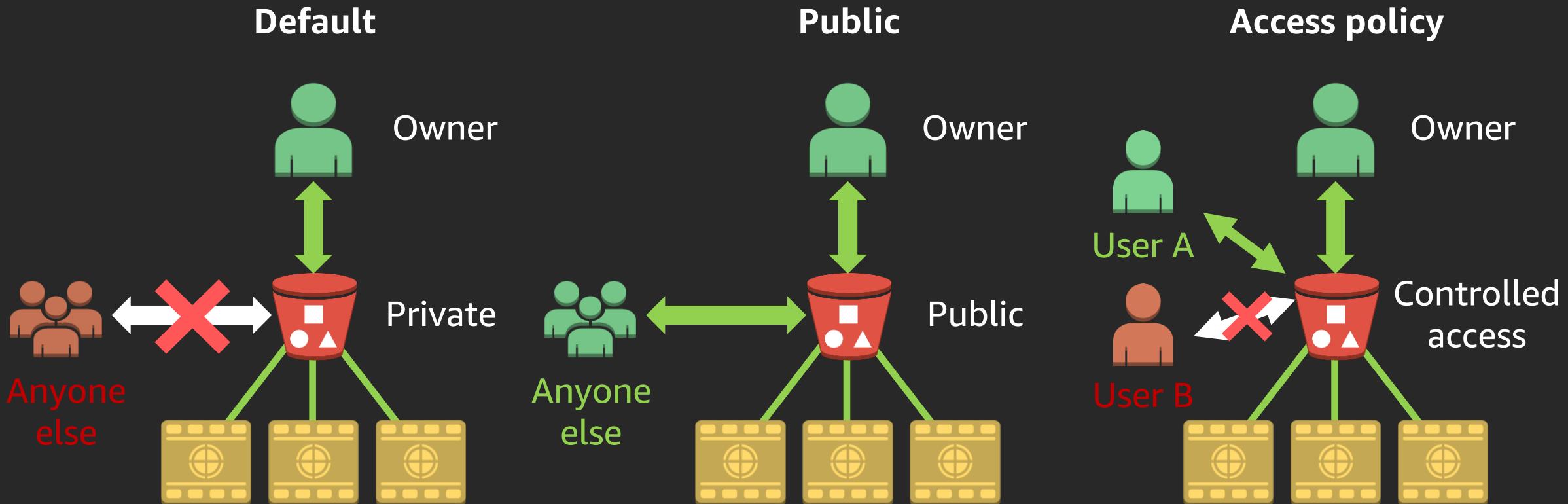
IAM users are not separate AWS accounts; they are users within your account

Each user has their own credentials

IAM users are authorized to perform specific AWS actions based on their permissions

# Amazon S3 access control: General

Some services support resource-based policies, such as S3 bucket policies



# AWS CloudTrail



AWS  
CloudTrail

Track user activity and API usage in your AWS account

- Continuously monitor user activities and record API calls
- Useful for compliance auditing, security analysis, and troubleshooting
- Log files are delivered to Amazon S3 buckets

Who?

What?

When?

Where?

API security-relevant information

# what is AWS Trusted Advisor?

A service providing guidance to help you reduce cost, increase performance, and improve security

## Cost optimization



0 ✓ 9 ▲ 0 !

**\$7,516.87**

Potential monthly savings

## Performance



3 ✓ 7 ▲ 0 !

## Security



2 ✓ 4 ▲ 11 !

## Fault tolerance



0 ✓ 15 ▲ 5 !

## Service limits



37 ✓ 0 ▲ 1 !

# Knowledge check

Which of the following are components of IAM?

- A. Group – collection of users with identical permissions
- B. Bucket – container for stored objects
- C. User – person or application that interacts with AWS
- D. Instance – copy of an AMI running as a virtual server
- E. Policy – formal statement of one or more permissions

# Knowledge check

Which of the following are components of IAM?

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- D. Instance – copy of an AMI running as a virtual server
- E. Policy – formal statement of one or more permissions

Answer: A, C, E

# Break



# **Section 2: Innovation with AWS**

# Internet of Things (IoT)

# What is the Internet of Things (IoT)?



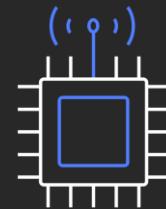
IoT is where a system of integrated devices, such as appliances, watches, or features in a car, can be connected to various applications

These connections enable data to be transferred to and from devices in a bidirectional communication flow over a network

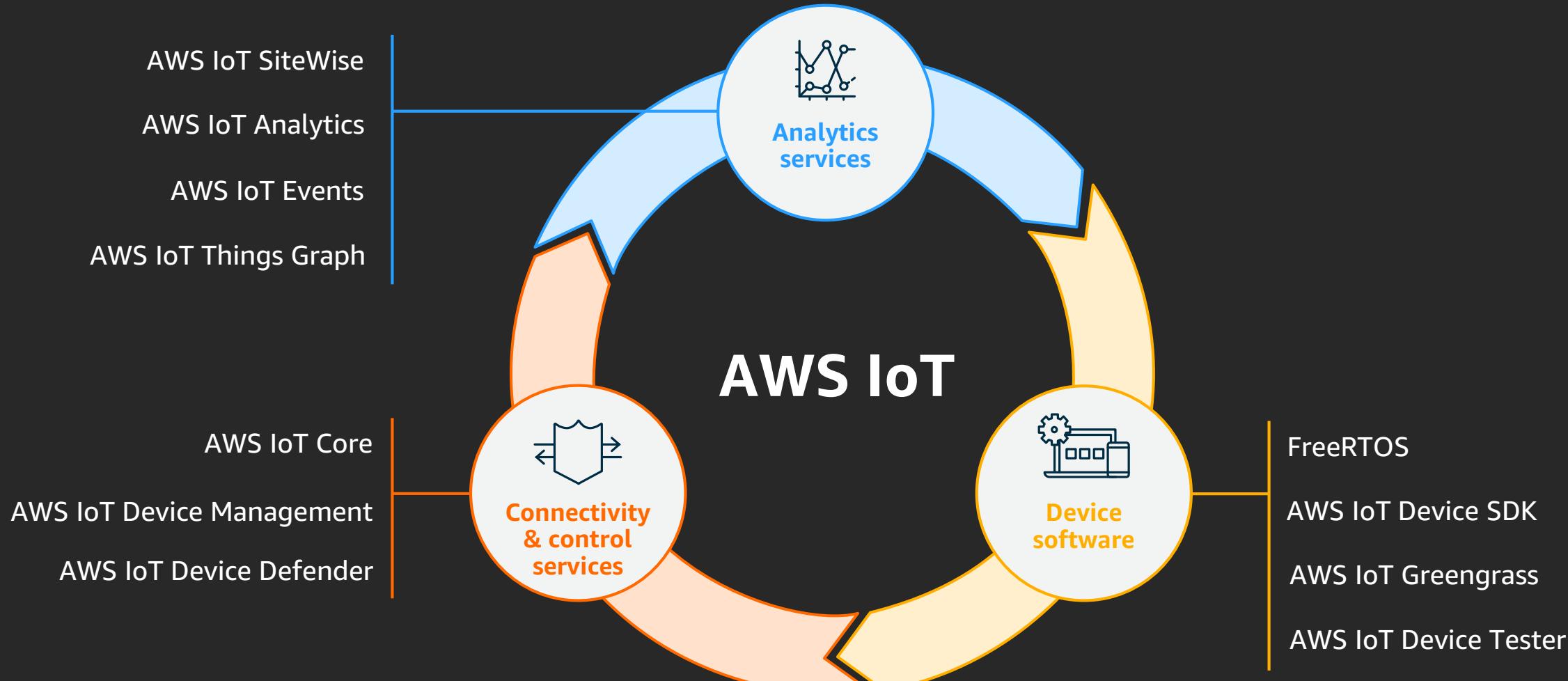
# Challenges of managing “things”

The task of managing IoT devices poses a number of challenges

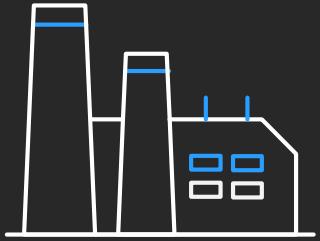
- Management and updates
  - Inconsistent or intermittent network connectivity
  - Devices are remote and may not be physically accessible
  - Large fleets of devices in production
- Analytics
  - Low compute power, low-spec on-device resources
  - Devices may emit large quantities of streaming data



# AWS IoT services



# what customers are doing with AWS IoT



Improve the performance and productivity of industrial processes



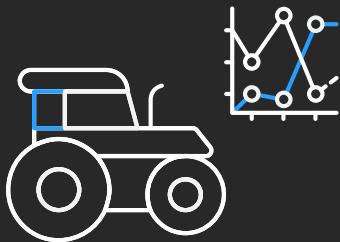
Remotely monitor patient health & wellness applications



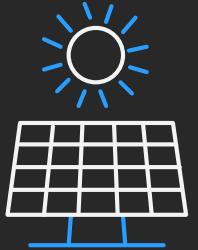
Track inventory levels and manage warehouse operations



Build smarter products & user experiences in homes, buildings, and cities



Grow healthier crops with greater efficiencies



Manage energy resources more efficiently



Transform transportation with connected and autonomous vehicles

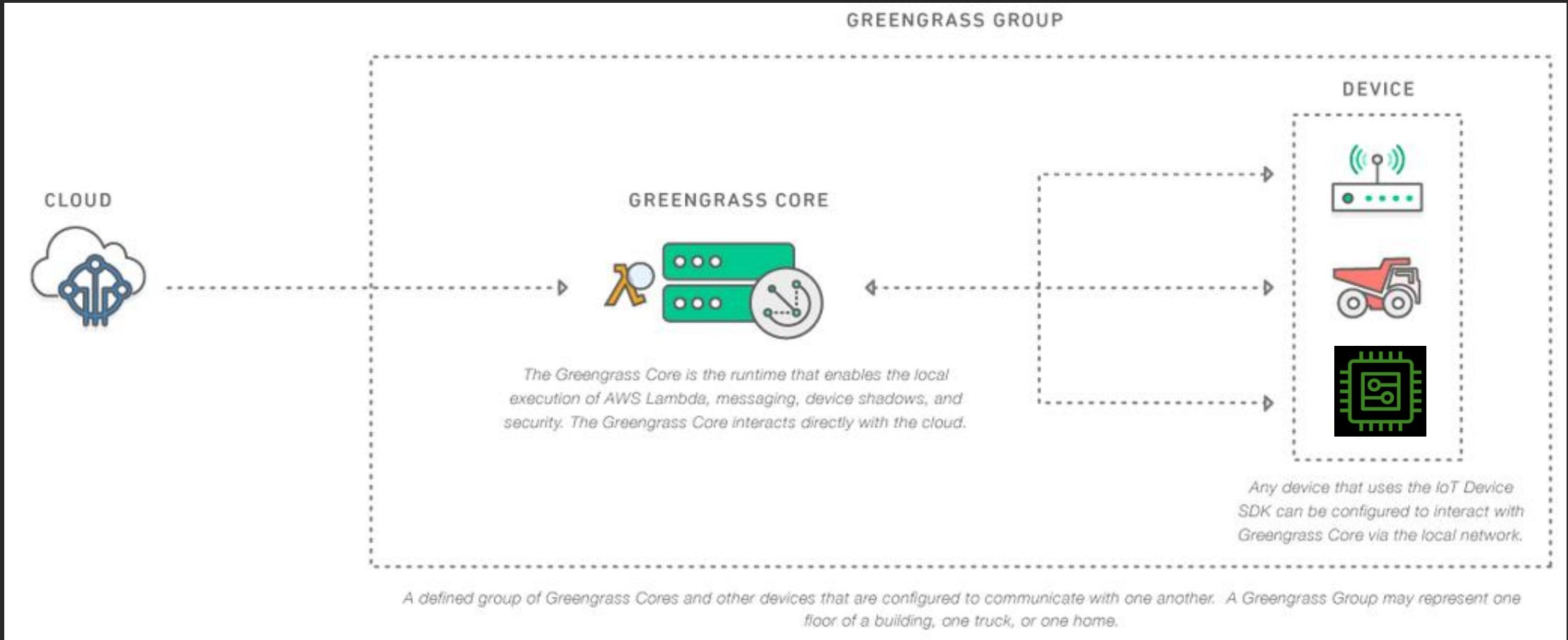


Enhance safety in the home, the office, and the factory floor

# AWS IoT core: Rapid development



# AWS IoT Greengrass





# Bayer CropScience



## Problem

In the seed business, it's important to gain better and faster visibility into what's going on in fields during planting and harvest within breeding research and supply chain organizations.

## Solution

AWS IoT helps Bayer Crop Science manage the collection, processing, and analysis of seed-growing data. Data analysts use the new data collection platform to access data on their mobile devices via dashboards. The solution captures multiple terabytes of data from seed transportation, planting, and growing in the company's research fields across the globe.

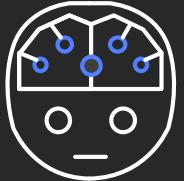
## Impact

Using AWS IoT, Bayer Crop Science can provide seed data to analysts in just a few minutes instead of a few days. This also helps farmers gain better visibility into field conditions and provides a robust edge processing and analytics framework.

# Machine learning



# what is machine learning?



## Artificial intelligence (AI)

Any technique that enables computers to mimic human intelligence using logic, if-then statements, and machine learning (including deep learning)



## Machine learning (ML)

Subset of AI that uses machines to search for patterns in data to build logic models automatically

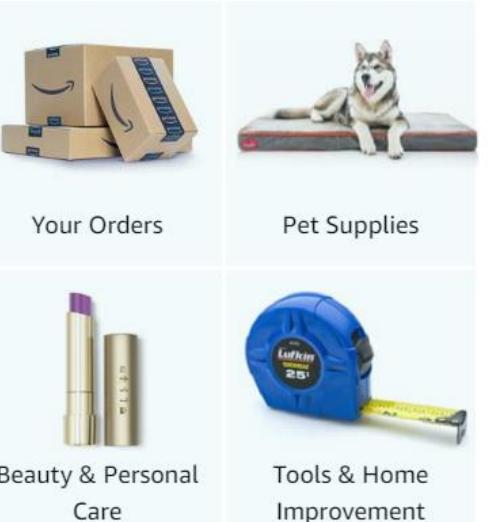


## Deep learning

Subset of ML composed of deeply multi-layered neural networks that perform tasks like speech and image recognition

# Amazon's machine learning innovation

## Recommendations for you



Your Orders

Pet Supplies

Beauty & Personal Care

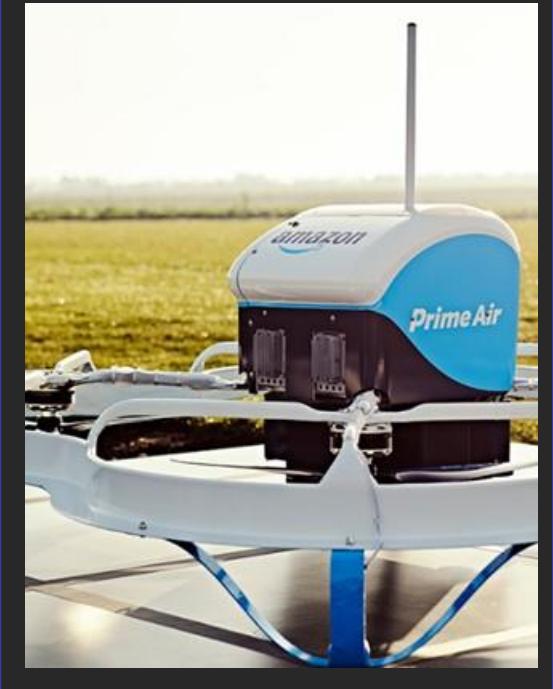
Tools & Home Improvement



1.6 million packages every day



Billions of Alexa interactions each week



4,000 products per minute sold on Amazon.com

First Prime Air delivery on Dec. 7, 2016

# AWS AI and machine learning services

BROADEST AND DEEPEST SET OF CAPABILITIES

## AI services

VISION	SPEECH	LANGUAGE	CHATBOTS	FORECASTING	RECOMMENDATIONS
 Amazon Rekognition Image  Amazon Rekognition Video  Amazon Textract	 Amazon Polly  Amazon Transcribe	 Amazon Translate  Amazon Comprehend & Comprehend Medical	 Amazon Lex	 Amazon Forecast	 Amazon Personalize

## ML services

 Amazon SageMaker	Ground Truth	Notebooks	Algorithms + Marketplace	Reinforcement learning	Training	Optimization	Deployment	Hosting
--	--------------	-----------	--------------------------	------------------------	----------	--------------	------------	---------

## ML frameworks + infrastructure

FRAMEWORKS	INTERFACES	INFRASTRUCTURE								
 TensorFlow  PyTorch	 MXNet  Keras		 EC2 P3 & P3dn  EC2 G4 EC2 C5	 FPGAs	 DL containers & AMIs	 Amazon ECS	 Amazon EKS	 AWS IoT Greengrass	 Amazon Elastic Inference	 AWS Inferentia

# Amazon SageMaker overview



## Amazon SageMaker

### Prepare →

SageMaker Ground Truth

**NEW**  
SageMaker Data Wrangler

SageMaker Processing

**NEW**  
SageMaker Feature Store

### Build →

SageMaker Studio notebooks

Built-in and  
bring-your-own algorithms

Local mode

SageMaker Autopilot

### Train & tune →

One-click training

SageMaker Experiments

Automatic model tuning

SageMaker Debugger

Managed spot training

### Deploy & manage →

One-click deployment

Kubernetes & Kubeflow  
integration

Multi-model endpoints

Model Monitor

**NEW**  
SageMaker Pipelines

### SageMaker Studio

Integrated development environment (IDE) for ML



## PROBLEM

---

3+ terabytes of data, 1,500+ hours of play time per week  
Needed a solution for real-time stats  
Lean team, no data science expertise

## SOLUTION: NEXT GEN STATS

---

Engaged with Amazon ML Solutions Lab  
Live data streamed to AWS from RFID tags on players and in game ball  
Data processed in 100+ steps in under 1 second  
ML models built on Amazon SageMaker make predictions in real time

## IMPACT

---

Launched 20+ stats quickly with limited data science team  
Sports announcers get interesting data points to engage fans

# Amazon Rekognition

## Object and scene detection

Photo-sharing applications can power smart searches and quickly find events or images, such as weddings, hiking, or sunsets

## Facial analysis

Retail businesses can understand the demographics and sentiment of in-store customers

## Face comparison

Hotels and hospitality businesses can provide personalized service for guests

## Facial recognition

Provide secondary authentication for existing applications



# Object and scene detection

Identify objects and scenes, and provide confidence scores

Use object and scene detection to add features that search, filter, and curate large image libraries



DetectLabels

# Facial analysis

Analyze facial characteristics in multiple dimensions

DetectFaces

## Demographic data

Age range: 29–45

## Facial landmarks

EyeLeft, EyeRight, Nose,  
RightPupil, LeftPupil,  
MouthRight, LeftEyeBrowUp,  
Bounding Box. . .

## Image quality

Brightness: 23.6%  
Sharpness: 99.9%



## Emotion expressed

Happy: 83.8%  
Surprised: 0.65%

## General attributes

Smile: True 23.6%  
EyesOpen: True 99.8%  
Beard: True 99.5%  
Mustache: True 99.9%

## Facial pose

Pitch: 1.446  
Roll: 5.725

# Blockchain



# what is blockchain?

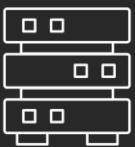


Blockchain makes it possible to build applications where multiple parties can execute transactions **without the need for a trusted, central authority**

Today, building a scalable blockchain network with existing technologies is complex to set up and hard to manage



Each network member needs to



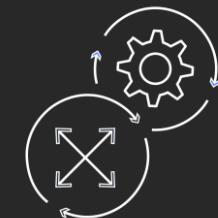
Manually provision hardware



Install software



Create & manage certificates for access control



Configure networking components

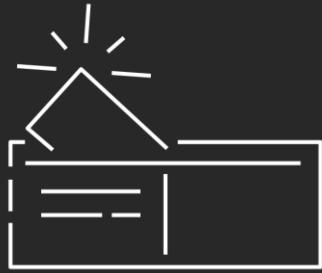
# Example use cases



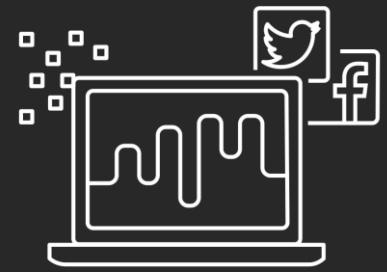
**Shipping**



**Supply chain  
management**



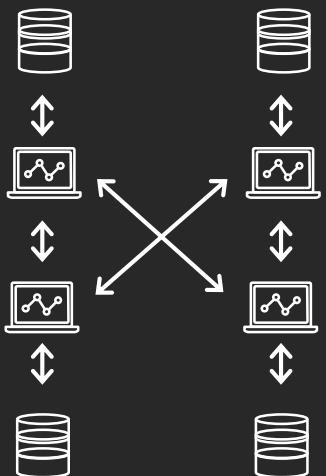
**Finance  
and banking**



**Digital  
advertising**

# Blockchain qualities

## Decentralized trust



**Financial institutions**  
Peer-to-peer payments

**Mortgage lenders**  
Process syndicated loans

**Supply chain**  
Transact with suppliers  
and distributors

**Retail**  
Streamline customer rewards

## Benefits

Transparency

Immutability

Auditability

Permissionless

Permissioned

Consortium

# AWS blockchain services

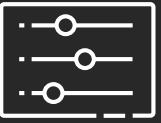


Amazon  
Managed  
Blockchain

Fully managed service that makes it easy to create and manage scalable blockchain networks using popular open-source frameworks

- Hyperledger Fabric
- Ethereum

# Amazon Managed Blockchain features



## Fully managed

Create a blockchain network in minutes



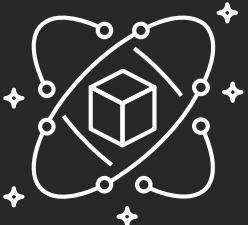
## Open-source variety

Support for two frameworks



## Decentralized

Democratically govern the network



## Reliable and scalable

Backed with Amazon QLDB technology



## Low cost

Only pay for resources used



## Integrated

Easily use with AWS services

# Nestlé's chain of origin coffee cultivates supply chain transparency with Amazon Managed Blockchain

## Challenge

Nestlé is the biggest procurer of coffee in the world, and it wanted to uncover transparency around its coffee bean supply chain beyond its brokers and buyers

## Solution

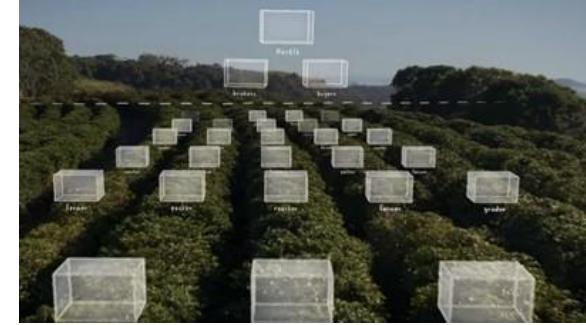
Nestlé turned to Amazon Managed Blockchain to trace back through every step in its supply chain – from the farmer and grader to the roaster and packer

“ Whether its how we ensure freshness, whether its making sure that the packaging being used is better for the planet, **it means that the value is going back to the farmers and the partners we're working with.** ”

Armin Nehzat, Digital Technology Manager, Nestlé

## Benefits

- Nestlé can now grow one-on-one relationships with coffee farmers and roasting facilities
- Because the secure blockchain ledger is public, it provides greater accountability to everyone in the supply chain



**Company:** Nestlé

**Country:** Switzerland (CH)

**Employees:** 300,000+

**Website:** [Nestle.com](http://Nestle.com)

## About Nestlé

Nestlé is the world's largest food and beverage company. It is present in 190 countries around the world, and it has 308,000 employees. Nestlé is also the biggest procurer of coffee globally.

# AWS Ground Station



# Common satellite data cloud processing use cases



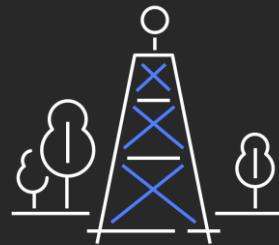
## Weather forecasting and agriculture

Commercial fruit producers can monitor crop health and water levels to ensure efficient use of limited resources



## Global shipping and anti-piracy

Leverage registries of ship placement, destination, and tracking to confirm accuracy of ship positioning, as well as be notified of any deviations from normal operations



## Earth observation and fire safety

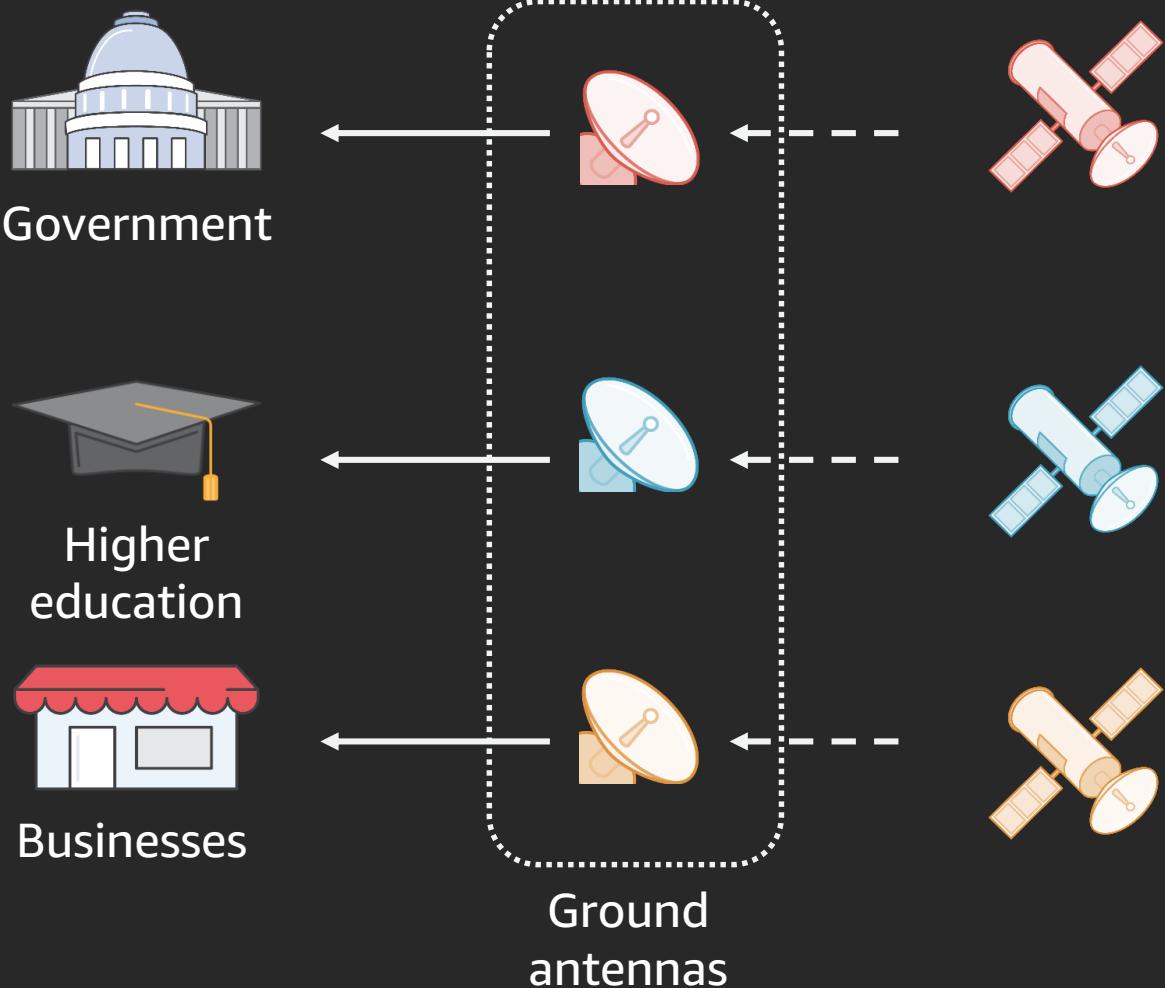
Use low-latency access to high-resolution heat mapped images of the earth to inform frontline fire commanders on safest, lowest heat entry points to fight fires



## Retail forecasting

4.8 million satellite images from 44 major US retailers confirms numbers of cars in parking lots and yields an informational advantage to forecasting accuracy

# Industry challenges



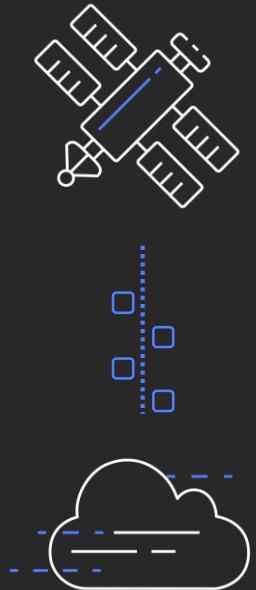
- Build, lease, or purchase unused bandwidth
- Are difficult to maintain
- Require high capital expenditure investment to scale
- Support opaque pricing
- Cause data access latency

# AWS Ground Station: What is it?

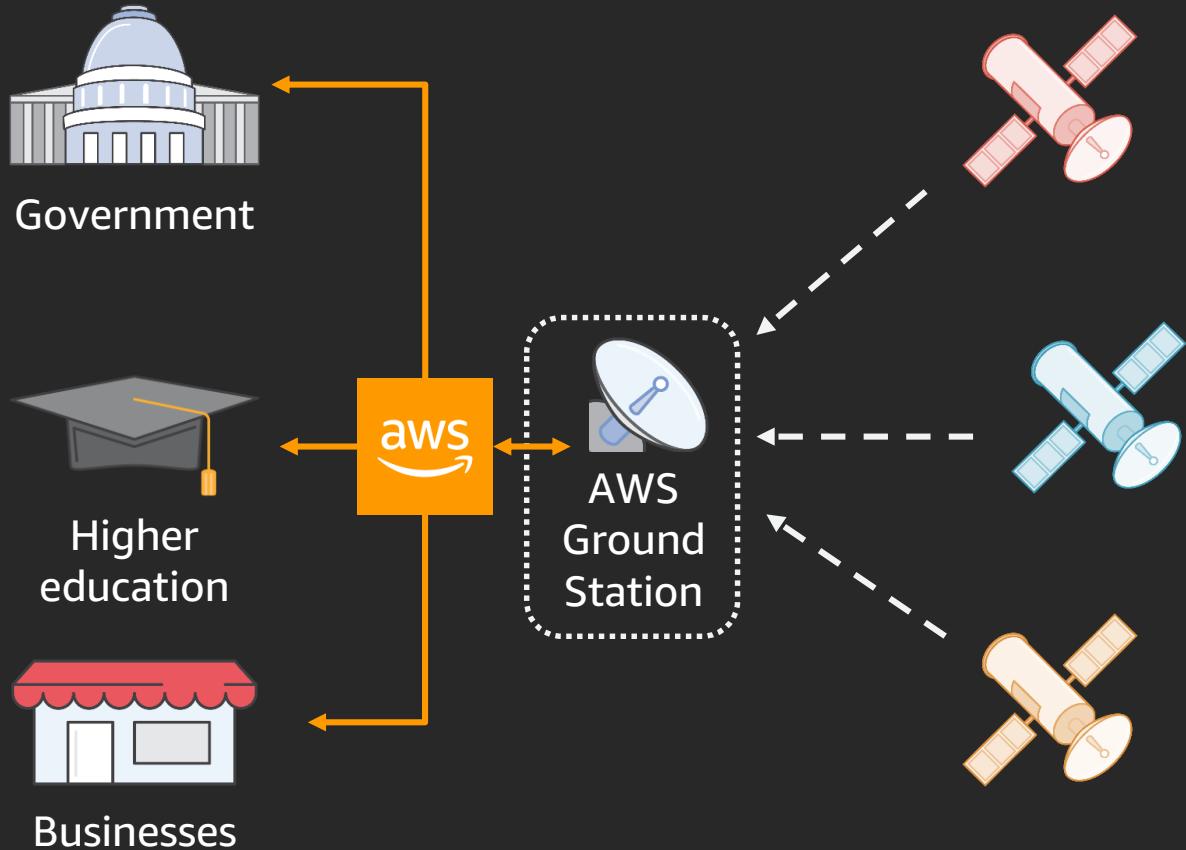
**AWS Ground Station** is a fully managed service that lets you control satellite communications, process data, and scale operations without having to worry about building or managing your own ground station infrastructure

These facilities provide communications between the ground and the satellites in space

- Low-latency global fiber network
- Direct access to AWS services
- Fully managed service (no infrastructure commitments)
- Pay-as-you-go pricing
- No licensing requirements
- Scale satellite communications on demand when your business needs it



# what AWS Ground Station offers



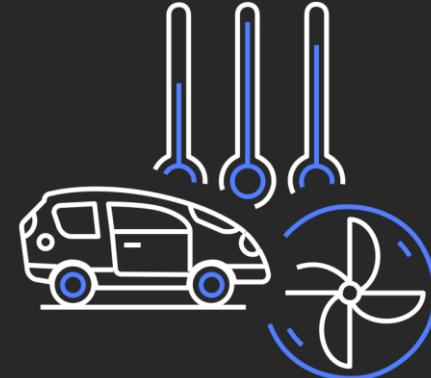
- Satellite ground support with no infrastructure commitments
- Pay-by-minute pricing
- Self-service scheduling
- Colocated ground stations and AWS data centers providing direct access to AWS resources and services
- Backhaul of base band data to customer Region of choice included in pricing
- Near-real-time data delivery

# AWS Wavelength



# Mobile edge computing: Characteristics

- **Massive number of devices** such as sensors, video cameras, and IoT devices generating large volumes of data
- Processing of data needs to happen **close to data generation**
- In real time with **very low latency**



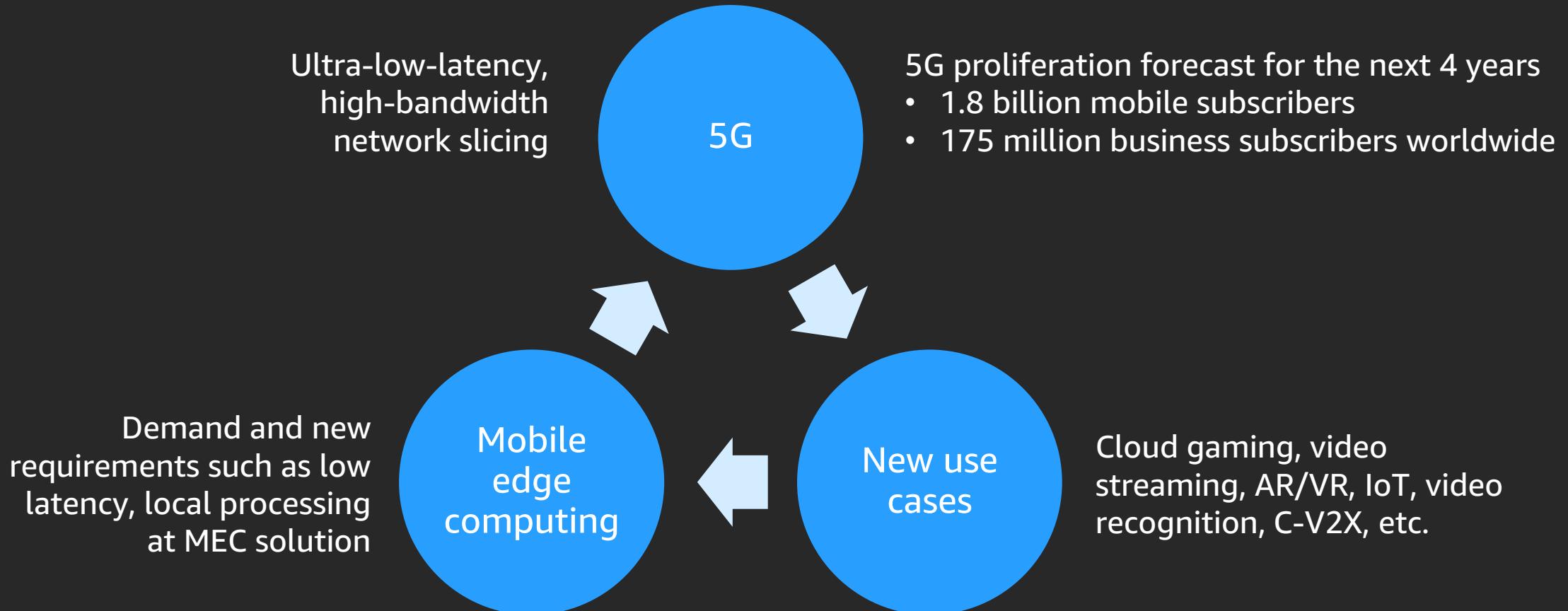
Total global mobile traffic expected to reach 131 EB (exabytes) per month by 2024\*

\* Ericsson Mobility Report, June 2019

<https://www.ericsson.com/49d1d9/assets/local/mobility-report/documents/2019/ericsson-mobility-report-june-2019.pdf>

# 5G and mobile edge computing

MOBILE SERVICE DELIVERY MODEL THAT IS CONSUMER- AND BUSINESS-FOCUSED



# AWS Wavelength



AWS  
Wavelength

AWS Wavelength combines the high bandwidth and ultra-low latency of 5G networks with AWS compute and storage services to enable developers to innovate and build a whole new class of applications

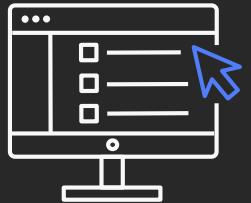
- AWS infrastructure and services in CSP 5G networks
- Ultra-low latency, local data processing
- Scalable capacity in CSP data center managed and supported by AWS

# AWS Wavelength: Built for the mobile edge

AWS SERVICES FROM INSIDE THE CSP MOBILE NETWORK



AWS compute and storage infrastructure embedded inside CSP mobile network



Single pane of management, across Wavelength Zone and AWS Regions



Access to services in the AWS Region



Develop applications once and deploy for use with 5G network globally



Failover from Wavelength Zone to AWS Region

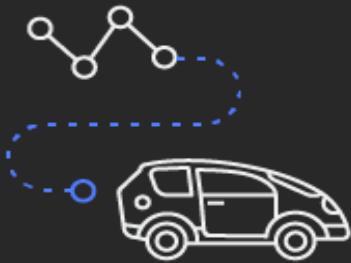
# AWS Wavelength use cases

## Healthcare



AI/ML solution for processing and analyzing video, images, and data for real-time diagnosis

## Connected vehicles (C-V2X)



Real-time monitoring of data from sensors for road safety, secure connectivity, in-car telematics, and autonomous driving

## Smart factory



Accelerating the industrial edge with AI/ML, video recognition for software-defined manufacturing

# LG uses AWS Wavelength for low-latency, high-throughput delivery of V2X data



"5G gives us that connectivity piece with high bandwidth and low latency, while **Wavelength is providing the necessary compute power at the edge to supplement the 5G technology**. So, it's about bringing security, privacy, connectivity, and compute together for the benefit of consumers and their safety."

**Harsh Kupwade Patil,**  
Security Leader & Principal Research Engineer, LG Electronics

# Next steps



# Choose your path



**Start  
building**



**Continue  
learning**



**Obtain  
certification**

# Start building: Tips for getting started



## AWS Free Tier

Gain free, hands-on experience with AWS products and services

[aws.amazon.com/free](https://aws.amazon.com/free)

## Billing alarms

Receive billing alerts that help you monitor the charges on your AWS bill

[In the Billing Console](#)

## Tools

AWS developer tools, command line tools, IDE & IDE toolkits, SDKs, mobile and IoT device SDKs

[aws.amazon.com/developer](https://aws.amazon.com/developer)

## Quick Starts

Automated, gold-standard deployments in the AWS Cloud

[aws.amazon.com/quickstart](https://aws.amazon.com/quickstart)

# Continue learning

## Learn at your own pace



Expand your AWS Cloud skills with our self-paced digital course, [AWS Cloud Practitioner Essentials](#)

## Learn from AWS experts



Build your AWS Cloud skills with our classroom course, [AWS Technical Essentials](#)

## Ramp-Up Guides



Our Cloud Practitioner [Ramp-Up Guide](#) offers a variety of resources to help build your knowledge of the AWS Cloud and prepare for the AWS Certified Cloud Practitioner certification

# Continue learning: AWS Ramp-Up Guides

## Your guides to learning the AWS Cloud

Downloadable AWS Ramp-Up Guides offer a variety of resources to help you build your skills and knowledge of the AWS Cloud

Each guide features carefully selected digital training, classroom courses, videos, whitepapers, certifications, and more

Explore the guides by role or solution area



Cloud  
Practitioner



Developer



Remote Work  
& Learning



Business



Databases



Game Tech



Architect



Operations



Internet of  
Things



Machine  
Learning



Media Services



Migration



Data Analytics



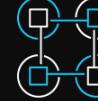
Security



Serverless



Storage



Containers



Cost  
Management

# AWS Ramp-Up Guides: Spotlight



## Cloud Practitioner

For business and  
technical professionals

## AWS Ramp-Up Guide: Cloud Practitioner

For Business and Technical Professionals



AWS Training and Certification has created this and other AWS Ramp-Up Guides to help build your knowledge of the AWS Cloud. This guide provides the resources—digital training, classroom courses, videos, whitepapers, certifications, and more—in a logical progression to help you learn the fundamentals of the AWS Cloud, including its primary benefits, pricing models, and core AWS services. To enroll in training and certification exams, and track your progress, visit [aws.training](#) and set up a free account.

### Step 1: Learn the fundamentals of the AWS Cloud

LEARNING RESOURCE	DURATION	TYPE
<a href="#">What is Cloud Computing?</a>	10 minutes	<a href="#">Webpage »</a>
<a href="#">What is AWS?</a>	5 minutes	<a href="#">Video »</a>
<a href="#">Types of Cloud Computing</a>	10 minutes	<a href="#">Webpage »</a>
<a href="#">Cloud Computing with AWS</a>	10 minutes	<a href="#">Webpage »</a>
<a href="#">AWS Fundamentals Overview</a>	10 minutes	<a href="#">Webpage »</a>
<a href="#">AWS Fundamentals Core Concepts</a>	1 hour	<a href="#">Webpage »</a>
<a href="#">Overview of AWS</a>	2 hours	<a href="#">Whitepaper »</a>
<a href="#">AWS Global Infrastructure</a>	20 minutes	<a href="#">Webpage »</a>
<a href="#">AWS Glossary</a>	30 minutes	<a href="#">Whitepaper »</a>
<a href="#">Job Roles in the Cloud</a>	30 minutes	<a href="#">Digital Training »</a>

### Step 2: Dive deeper into AWS Cloud fundamentals, including AWS pricing and support, and core AWS services

LEARNING RESOURCE	DURATION	TYPE
<a href="#">AWS Cloud Practitioner Essentials</a>	6 hours	<a href="#">Digital Training »</a>
	1 day	<a href="#">Classroom Training »</a>
<a href="#">AWS Cloud Security</a>	10 minutes	<a href="#">Webpage »</a>
<a href="#">Shared Responsibility Model</a>	10 minutes	<a href="#">Webpage »</a>

# Validate expertise with AWS Certification

## Professional

Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud



## Associate

One year of experience solving problems and implementing solutions using the AWS Cloud



## Foundational

Six months of fundamental AWS Cloud and industry knowledge



## Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the [exam guide](#)



## Why certify?

- Demonstrate your expertise
- Earn recognition and visibility
- Foster credibility with your employer and peers

## Certification resources

- Exam readiness training
- Self-paced labs

# Thank you!





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