

# Module 2:

## Getting started with the cloud

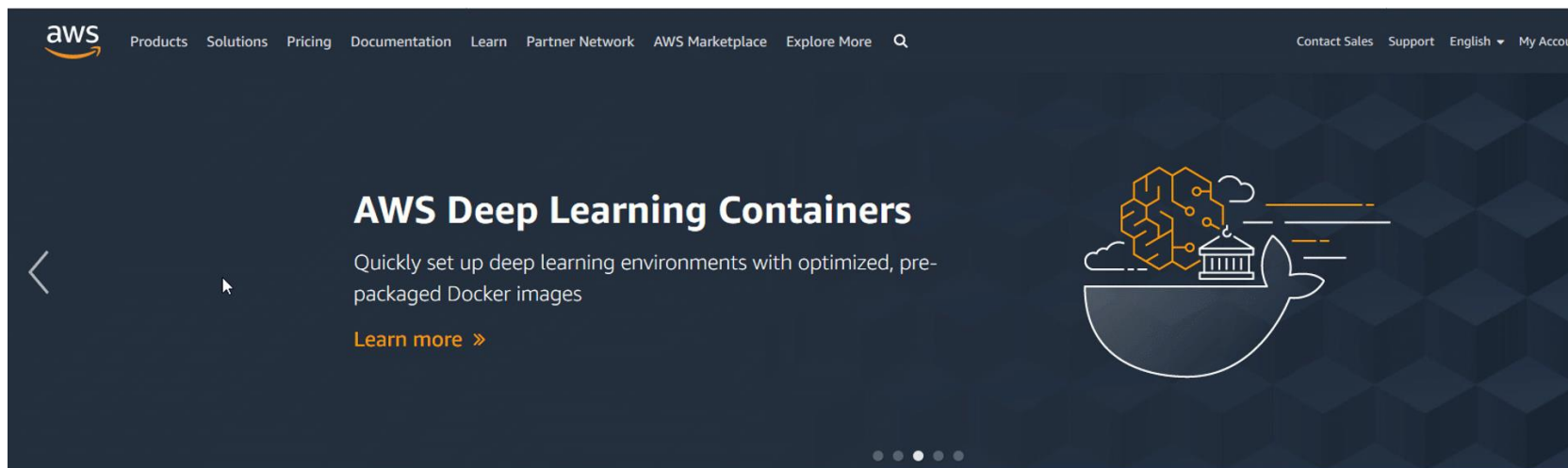
Patrick Do  
Technical Trainer  
AWS







# Getting started with AWS services

# AWS products




The screenshot shows the top of the AWS website. The header includes the AWS logo and navigation links: Products, Solutions, Pricing, Documentation, Learn, Partner Network, AWS Marketplace, Explore More, and a search icon. On the right, there are links for Contact Sales, Support, English, and My Account. The hero section features a dark blue background with a geometric pattern. On the left, there is a large white arrow pointing left. In the center, the text reads "AWS Deep Learning Containers" in white, followed by "Quickly set up deep learning environments with optimized, pre-packaged Docker images" and a "Learn more »" link. On the right, there is a stylized illustration of a brain with circuitry and a classical building, all contained within a white outline of a hand.

aws Products Solutions Pricing Documentation Learn Partner Network AWS Marketplace Explore More  Contact Sales Support English  My Account


## AWS Deep Learning Containers

Quickly set up deep learning environments with optimized, pre-packaged Docker images

[Learn more »](#)




**Amazon Lightsail**  
Everything you need to get started on AWS—for a low, predictable price



**Amazon EC2 M5ad & R5ad Instances**  
10% lower cost compute and memory compared to comparable instances



**Amazon S3 Glacier Deep Archive**  
A new S3 storage class that provides secure, durable object storage for long-term data retention



**110,000+ Databases Migrated to AWS**  
Save time & cost—migrate to fully managed databases

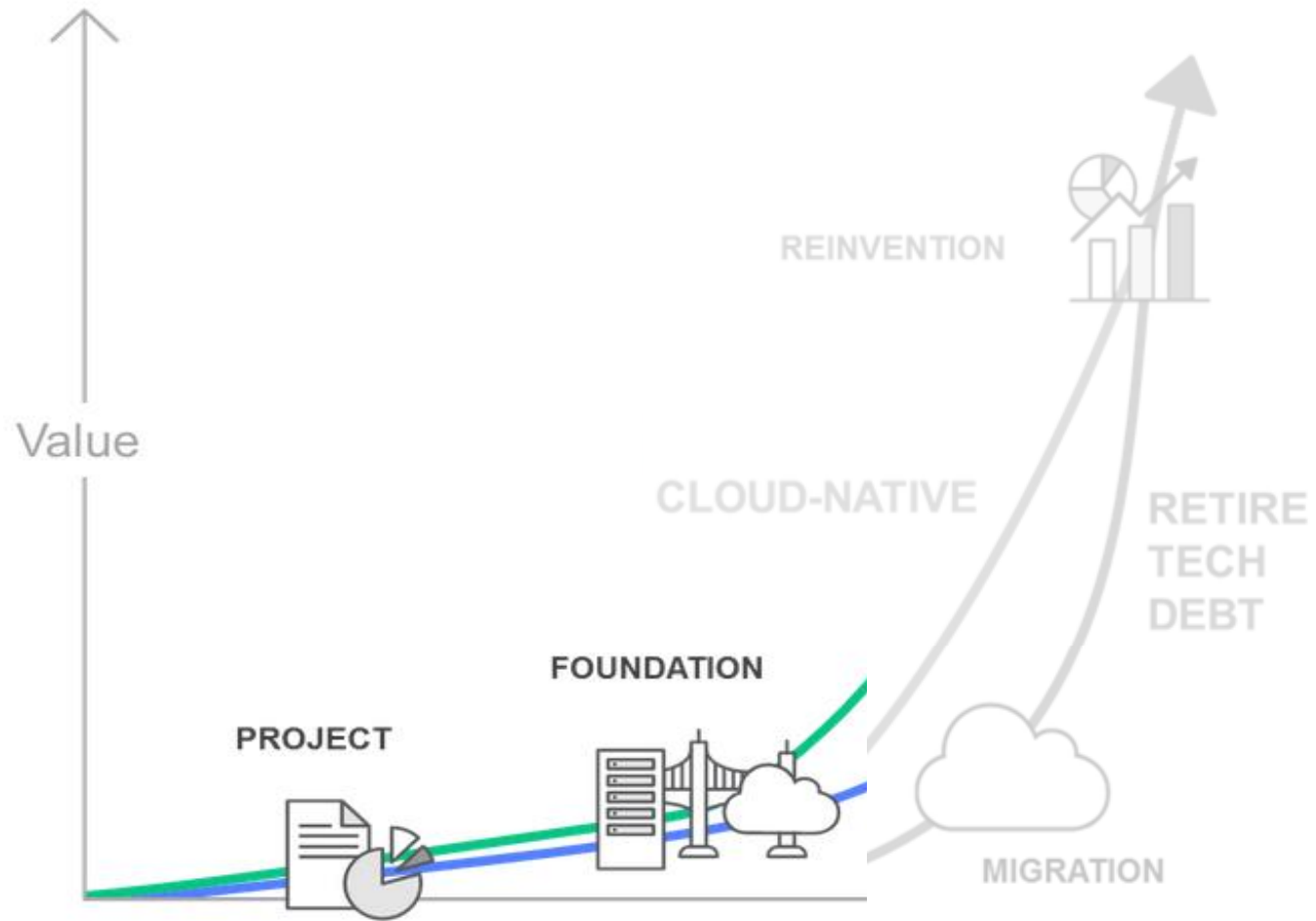
### AWS Customer News

Volkswagen Group plans to build the Volkswagen Industrial Cloud, an industrial digital production platform that will transform the company's manufacturing and logistics processes, on AWS. [Read the press release »](#)



Explore Our Products

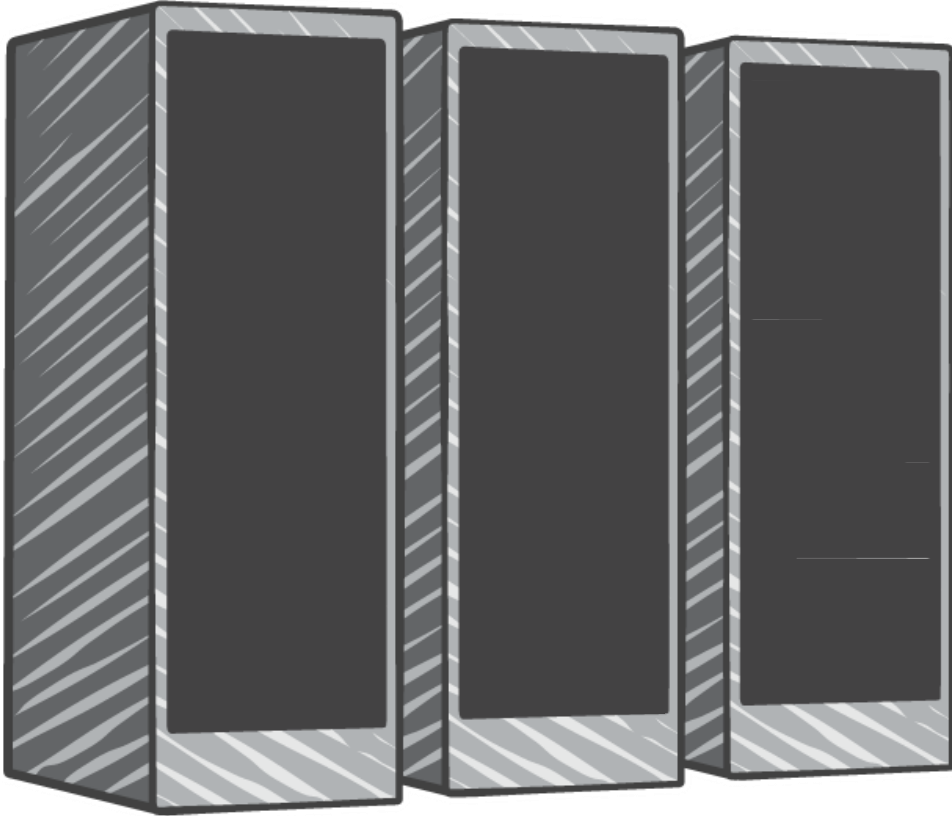
# Cloud journey





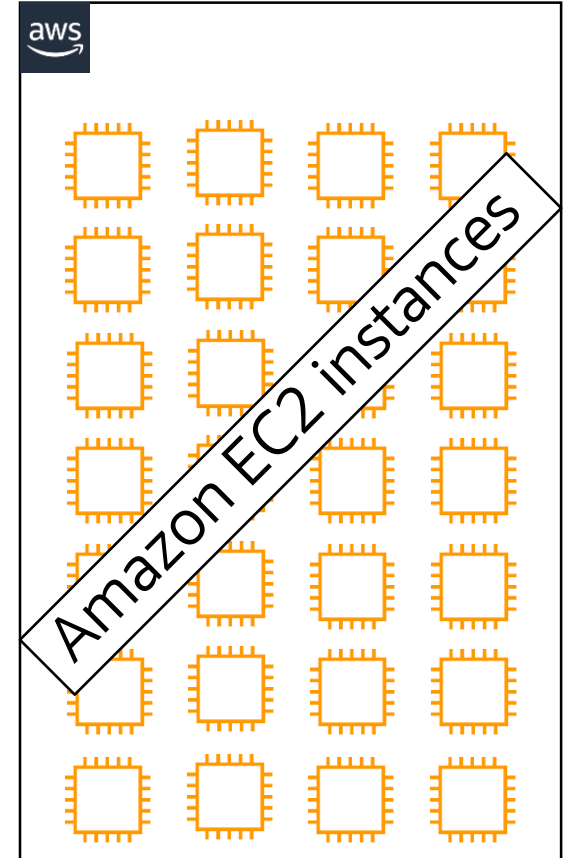
# Build your infrastructure

# What is Amazon EC2?



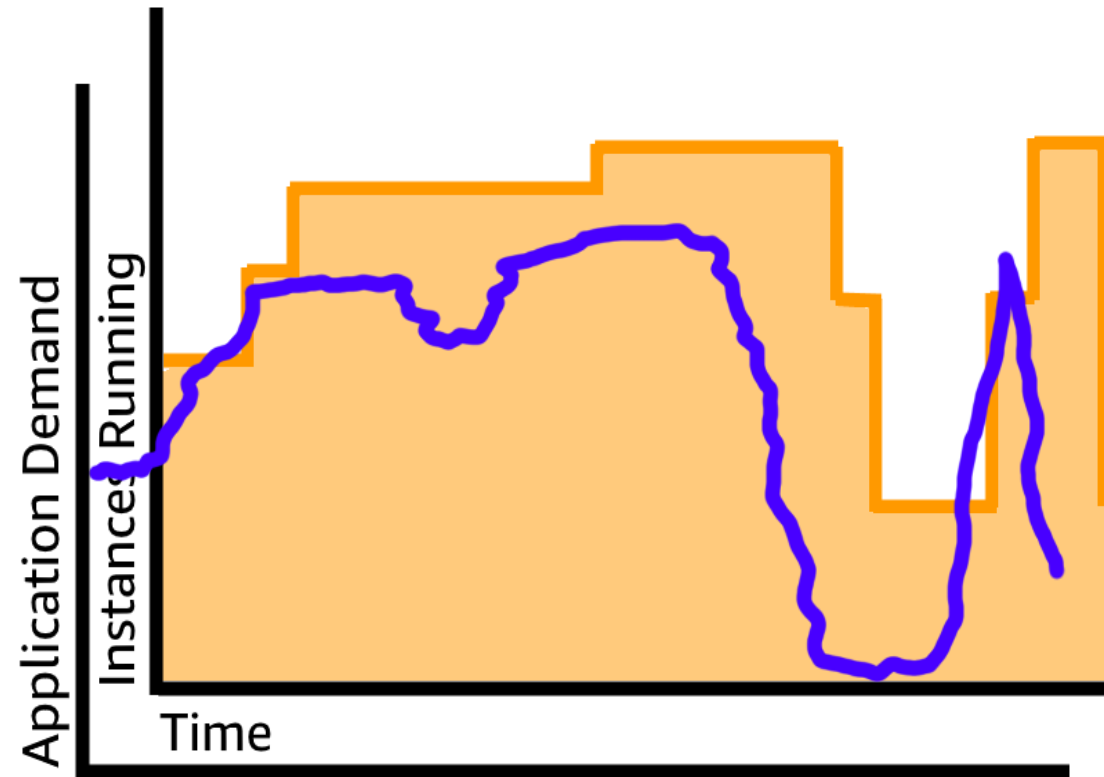
On-premises servers

- ✓ Application server
- ✓ Web server
- ✓ Database server
- ✓ Game server
- ✓ Mail server
- ✓ Media server
- ✓ Catalog server
- ✓ File server
- ✓ Computing server
- ✓ Proxy server



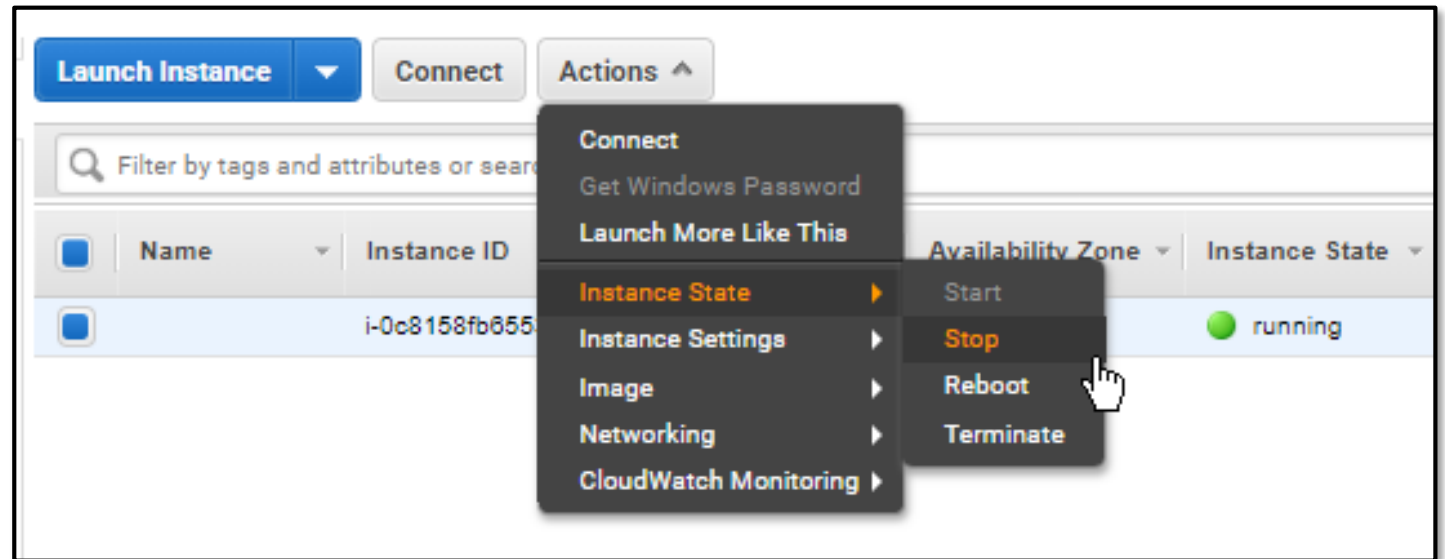
# Benefits of Amazon EC2

- Elasticity



# Benefits of Amazon EC2

- Elasticity
- Control





# Benefits of Amazon EC2

- Elasticity
- Control
- Flexibility

**Step 2: Choose an Instance Type**  
applications. [Learn more](#) about instance types and how they can meet your computing needs.

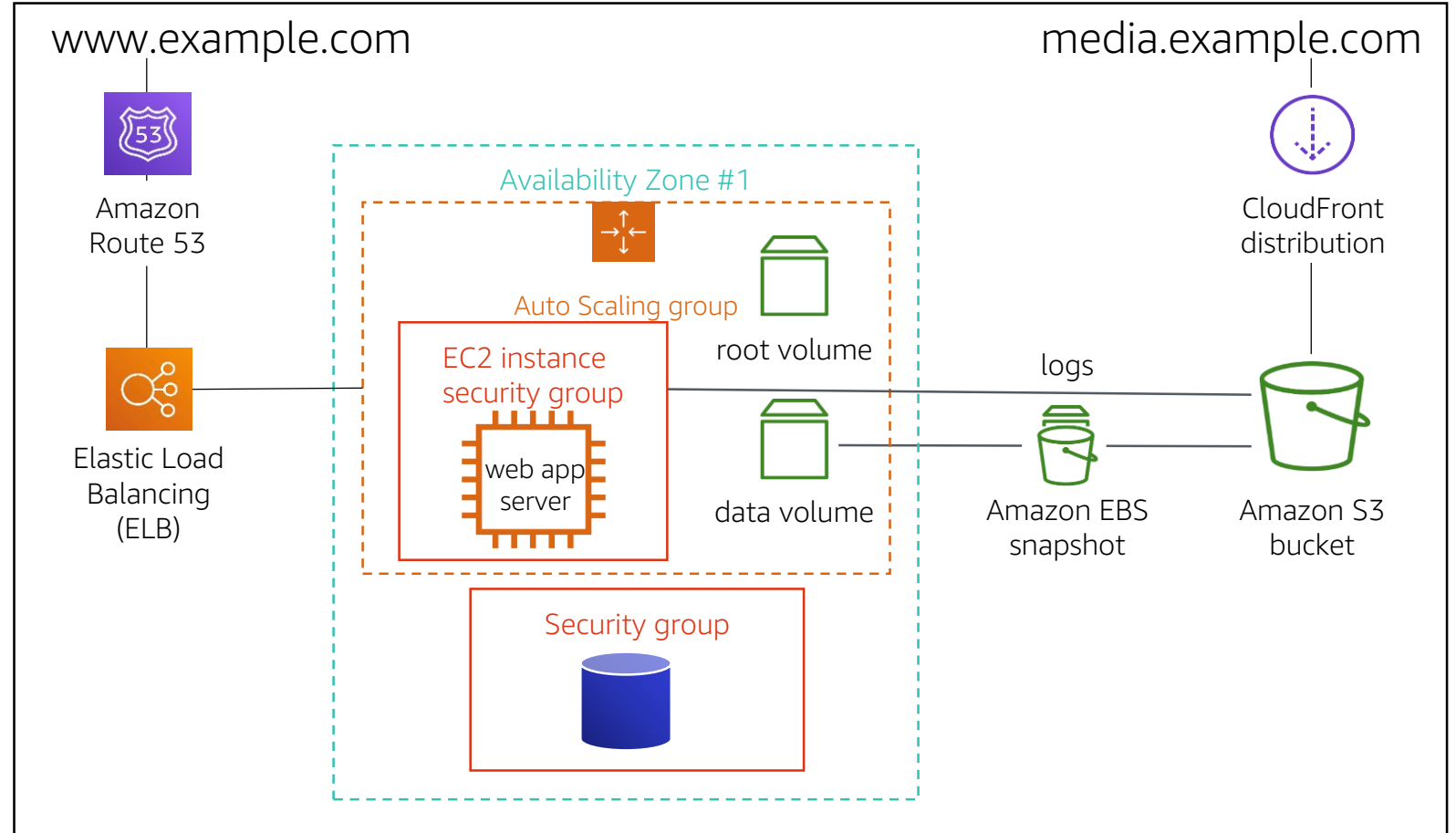
Filter by: **Compute optimized** **Current generation** [Show/Hide Columns](#)

Currently selected: t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5d.large	2	4	1 x 50 (SSD)	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5d.xlarge	4	8	1 x 100 (SSD)	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5d.2xlarge	8	16	1 x 200 (SSD)	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5d.4xlarge	16	32	1 x 400 (SSD)	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5d.9xlarge	36	72	1 x 900 (SSD)	Yes	10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5d.18xlarge	72	144	2 x 900 (SSD)	Yes	25 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5.large	2	4	EBS only	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5.xlarge	4	8	EBS only	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5.2xlarge	8	16	EBS only	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5.4xlarge	16	32	EBS only	Yes	Up to 10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5.9xlarge	36	72	EBS only	Yes	10 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c5.18xlarge	72	144	EBS only	Yes	25 Gigabit	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c4.large	2	3.75	EBS only	Yes	Moderate	Yes
<input type="checkbox"/>	<a href="#">Compute optimized</a>	c4.xlarge	4	7.5	EBS only	Yes	High	Yes

# Benefits of Amazon EC2

- Elasticity
- Control
- Flexibility
- Integrated



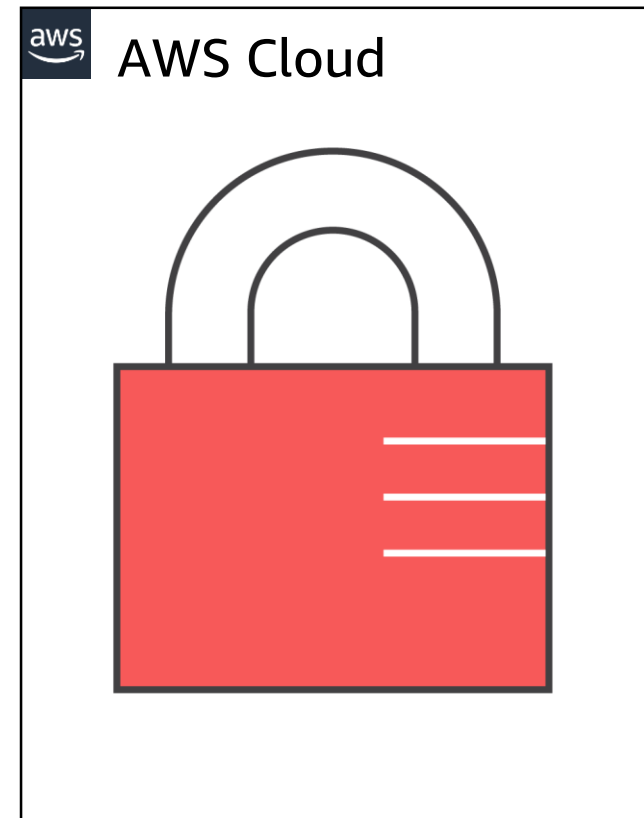
# Benefits of Amazon EC2

- Elasticity
- Control
- Flexibility
- Integrated
- Reliable



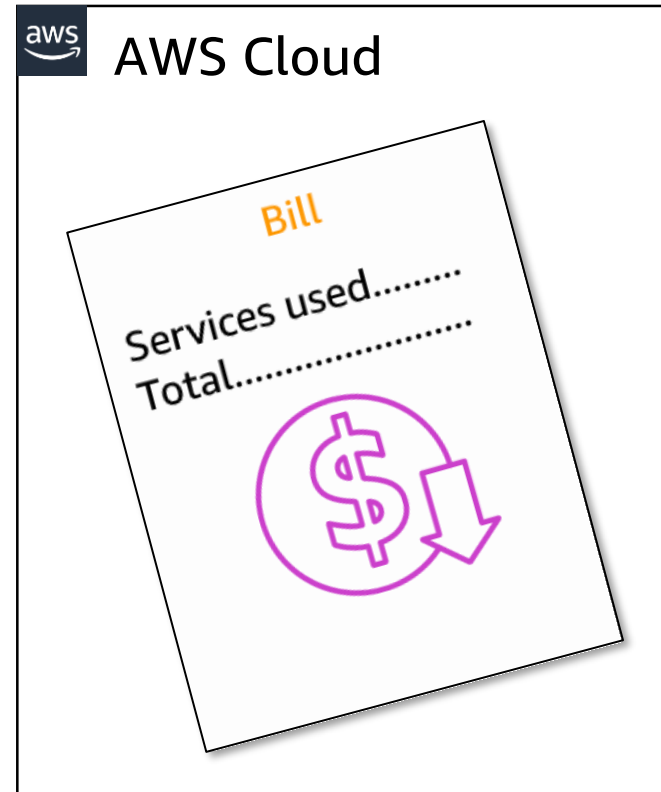
# Benefits of Amazon EC2

- Elasticity
- Control
- Flexibility
- Integrated
- Reliable
- Secure



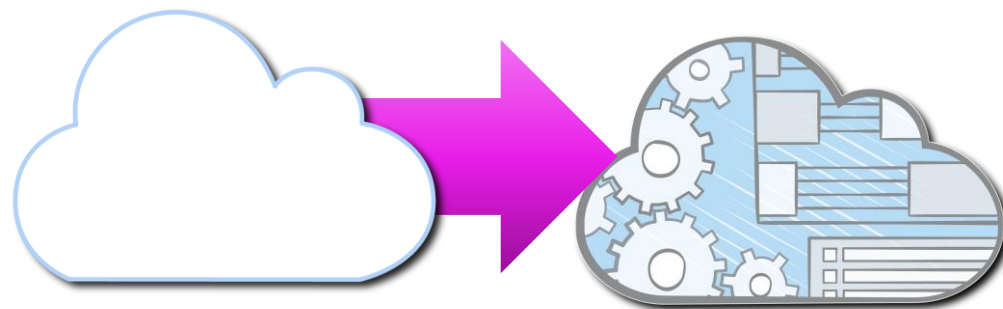
# Benefits of Amazon EC2

- Elasticity
- Control
- Flexibility
- Integrated
- Reliable
- Secure
- Inexpensive



# Benefits of Amazon EC2

- Elasticity
- Control
- Flexibility
- Integrated
- Reliable
- Secure
- Inexpensive
- Easy



# Choosing the right Amazon EC2 instances



- EC2 Instance types are optimized for different use cases, workloads & come in multiple sizes. This allows you to optimally scale resources to your workload requirements.
- AWS utilizes Intel® Xeon® processors for EC2 Instances providing customers with high performance and value.
- Consider the following when choosing your instances: core count, memory size, storage size & type, network performance, I/O requirements & CPU technologies.
- Hurry Up & Go Idle - A larger compute instance can save you time and money, therefore paying more per hour for a shorter amount of time can be less expensive.

# EC2 instances powered by Intel Technologies



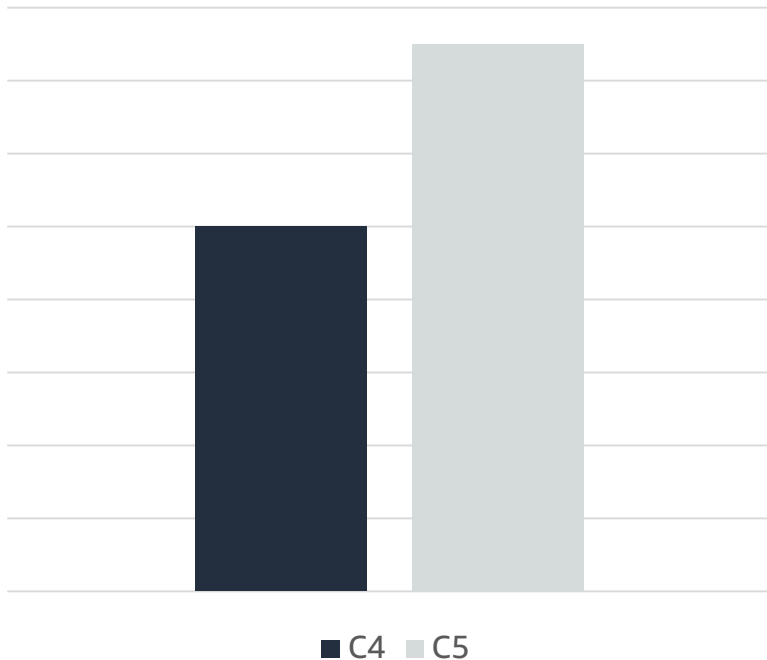
EC2 instance type	Compute optimized		General purpose			Memory optimized			Storage optimized		
	C5	C4	M5	M4	T2	X1	X1e	R4	H1	I3	D2
Intel processor	Xeon Platinum 8175M	Xeon E5 2666 v3	Xeon Platinum 8175M	Xeon E5 2686 v4 2676 v3	Xeon Family	Xeon E7 8880 v3	Xeon E7 8880 v3	Xeon E5 2686 v4	Xeon E5 2686 v4	Xeon E5 2686 v4	Xeon E5 2676 v3
Intel processor technology	Skylake	Haswell	Skylake	Broadwell Haswell	Yes	Haswell	Haswell	Broadwell	Broadwell	Broadwell	Haswell
Intel AVX	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intel AVX2	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes	Yes
Intel AVX-512	Yes	-	Yes	-	-	-	-	-	-	-	-
Intel turbo boost	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Storage	EBS-only	EBS-only	EBS-only	EBS-only	EBS-only	SSD EBS-Opt	SSD EBS-Opt	-	HDD	SSD	HDD



# C5: Compute-optimized instances



25% price/performance  
improvement over C4



- Based on 3.0 GHz Intel Xeon Scalable Processors (Skylake)
- Up to 72 vCPUs and 144 GiB of memory (**2:1 Memory:vCPU ratio**)
- 25 Gbps NW bandwidth
- Support for Intel AVX-512

**NETFLIX**

*"We saw significant performance improvement on Amazon EC2 C5, with up to a 140% performance improvement in industry standard CPU benchmarks over C4."*

**GRAIL**

*"We are eager to migrate onto the AVX-512 enabled c5.18xlarge instance size... . We expect to decrease the processing time of some of our key workloads by more than 30%."*

# C5n: fastest networking in the cloud <sup>NEW!</sup>

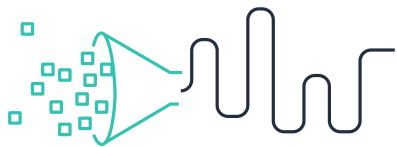
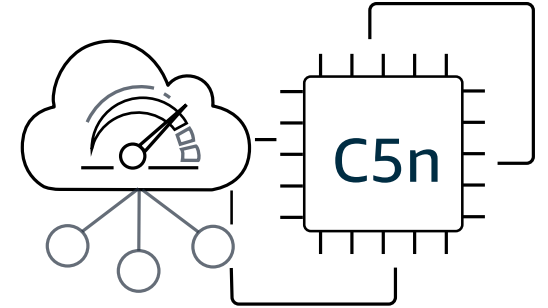


Featuring Intel Xeon Scalable processors

100 Gbps network bandwidth on largest instance sizes

25 Gbps peak bandwidth on smaller instance sizes

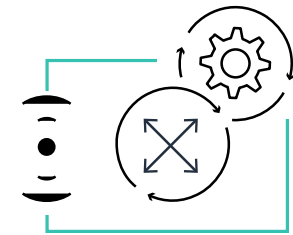
33% Increased memory footprint over C5 instances



Faster analytics and  
big data workloads



Lower costs for  
network-bound workloads



All of the elasticity, security,  
and scalability of AWS

# z1d: high frequency for specialized workloads



High Frequency instances with custom Intel Xeon Scalable processors running at sustained 4 GHz all core turbo

8:1 GiB to vCPU ratio

Up to 25 Gbps network bandwidth and up to 1.8 TB of local NVMe storage

z1d.large

16 GiB

2 vCPU

6 sizes

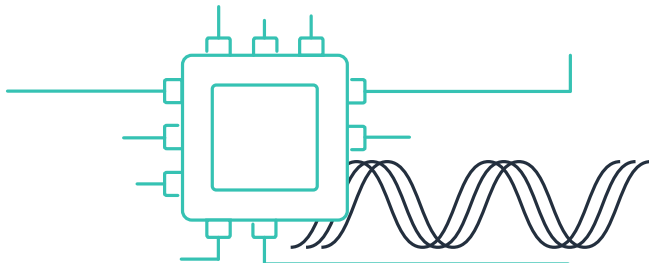


z1d.12xlarge

384 GiB

48 vCPU

Electronic Design Automation



Relational databases



Gaming



*z1d.metal Bare Metal instances coming soon*

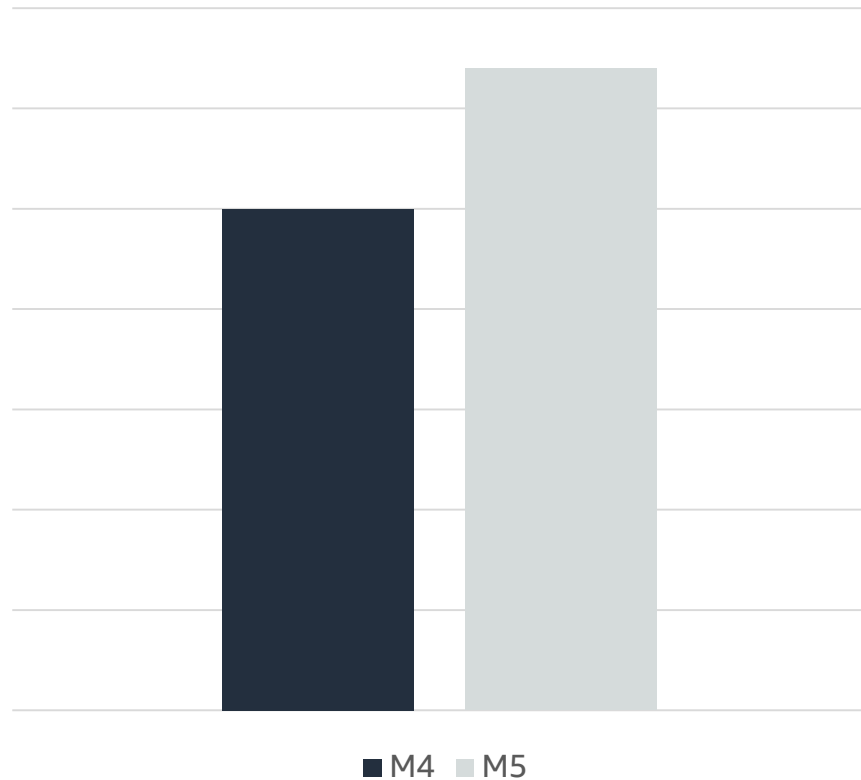
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# M5: Next-gen general purpose instances



**14% price/performance improvement** With M5



- Powered by 2.5 GHz Intel Xeon Scalable Processors (Skylake)
- New larger instance size—m5.24xlarge with 96 vCPUs and 384 GiB of memory (**4:1 Memory:vCPU ratio**)
- Improved network and EBS performance on smaller instance sizes
- Support for Intel AVX-512 offering up to twice the performance for vector and floating point workloads

# T3: burstable general-purpose instances

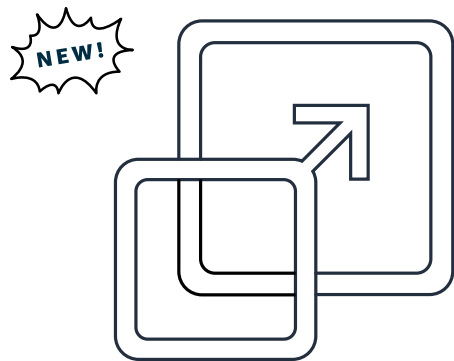
- Balance of compute, memory, and network
- Baseline level of CPU performance with the ability to burst CPU usage when needed at any time for as long as required
- Lowest cost instance at \$0.0052 per hour and up to 30% better price performance over T2 using Intel Xeon Scalable Processors

<b>t3.nano</b>
0.5 GiB
2 vCPU
Base perf 5%

7 sizes



<b>t3.2xlarge</b>
32 GiB
8 vCPU
Base perf 40%



**With T3 Unlimited bursting over baseline is only \$0.05 per vCPU-hour, averaged over 24 hours**

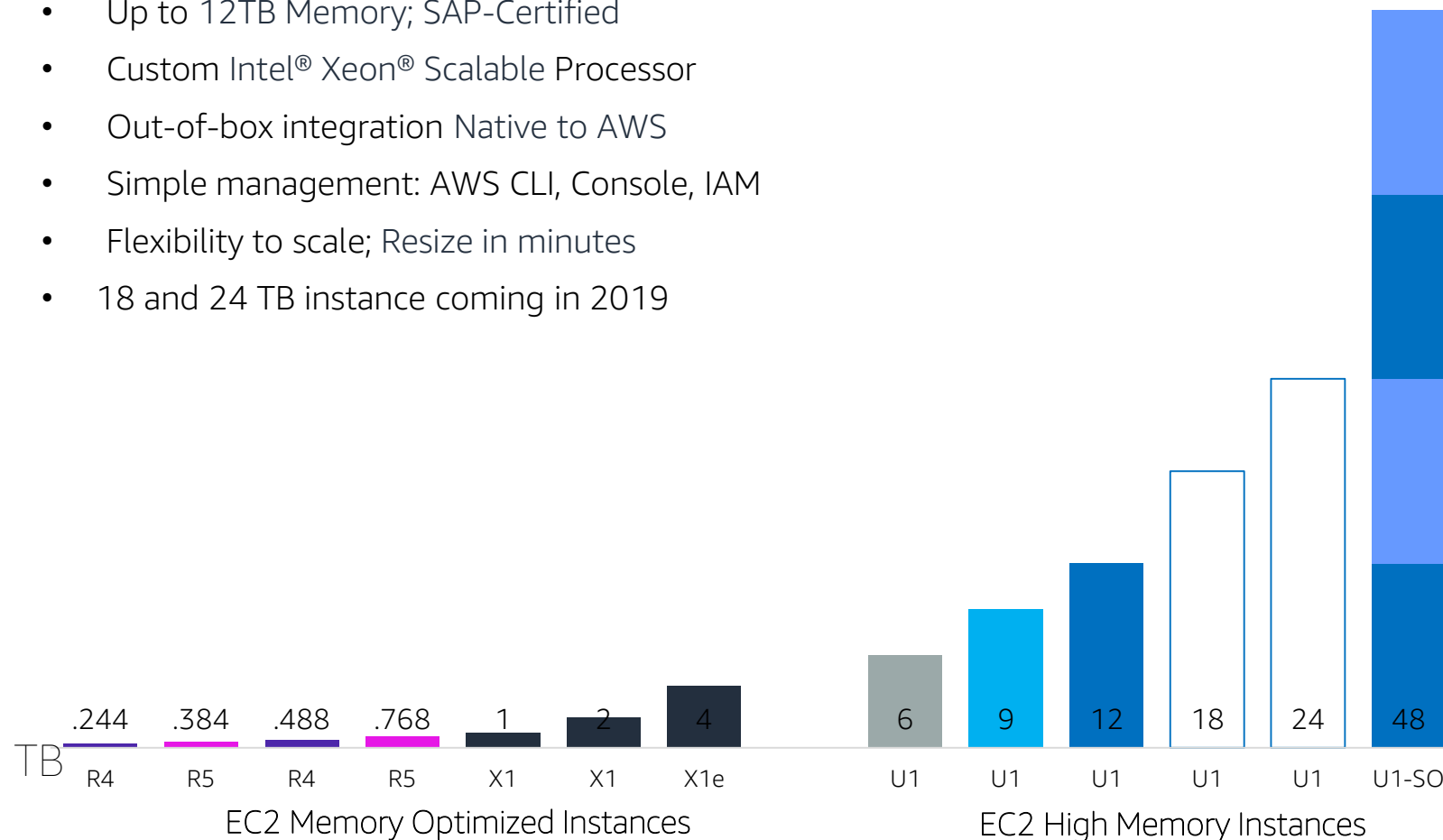


# Amazon EC2 instances for SAP HANA

*Introducing 48TB support for S/4HANA Deployments*



- Up to 12TB Memory; SAP-Certified
- Custom Intel® Xeon® Scalable Processor
- Out-of-box integration Native to AWS
- Simple management: AWS CLI, Console, IAM
- Flexibility to scale; Resize in minutes
- 18 and 24 TB instance coming in 2019



Grow-as-you-Go



Linear Pricing



Seamless access to all AWS Services



Near Infinite Elastic Scalability for Mission-Critical Deployments



AWS owned and operated



<1 hour provisioning times  
100% Software Defined

# R5: memory-optimized instances

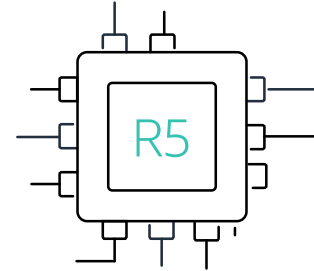


2.5 GHz Intel Xeon Scalable processors (Skylake)

Memory-optimized instances with 8:1 GiB to vCPU

Up to 25 Gbps NW bandwidth

R5d instances include up to 3.6 TB of local NVMe SSD



r5.large

16 GiB

2 vCPU

6 sizes  
● ● ●

r5.24xlarge

768 GiB

96 vCPU

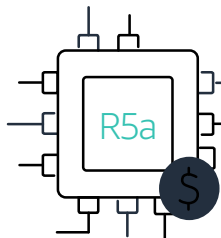
In-memory caches



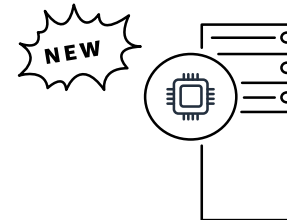
High performance databases



Big data analytics



R5a: Now available with  
AMD EPYC 7000 processor



**R5.metal** Bare Metal instances  
coming soon on Intel Xeon  
Scalable processors

# EC2 High Memory Instance architecture

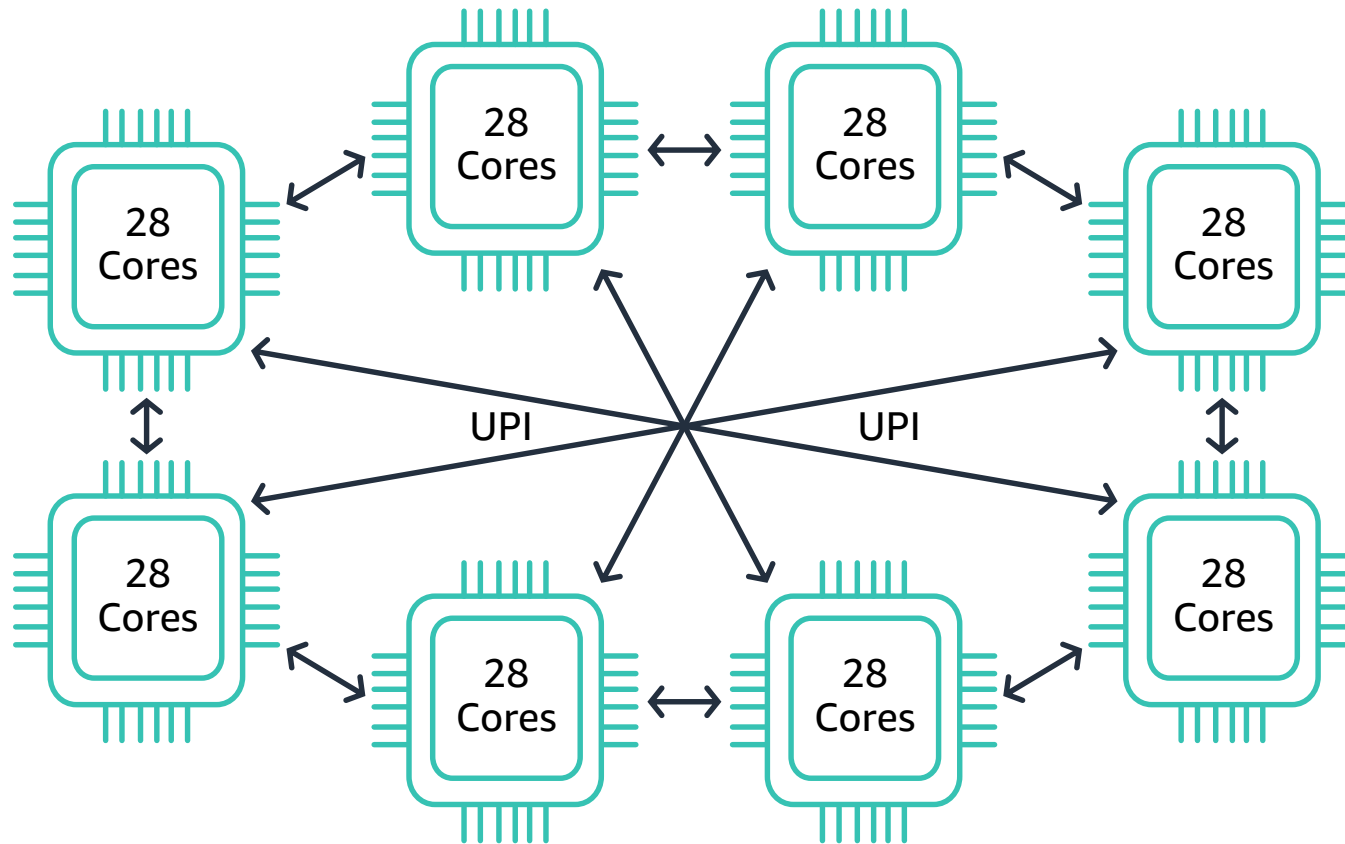


**The Most Memory of any EC2 Instance**  
**SAP-Certified**

12 TB of Memory

8x Intel Xeon Platinum 8176M  
(Skylake) processors with total of  
224 cores / 448 Hyperthreads

18TB and 24TB Coming in 2019





# What's your platform?

## Step 1: Choose an Amazon Machine Image (AMI)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

Search for an AMI by entering a search term e.g. "Windows"

### Quick Start

My AMIs

AWS Marketplace

Community AMIs

☐ Free tier only ⓘ



**Amazon Linux**  
Free tier eligible

### Amazon Linux 2 AMI (HVM), SSD Volume Type - ami-0d1000aff9a9bad89

Amazon Linux 2 comes with five years support. It provides Linux kernel 4.14 tuned for optimal performance on Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1, and the latest software packages through extras.

Root device type: ebs    Virtualization type: hvm    ENA Enabled: Yes

Select

64-bit



**Amazon Linux**  
Free tier eligible

### Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-a0cfeed8

The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl, and Java. The repositories include Docker, PHP, MySQL, PostgreSQL, and other packages.

Root device type: ebs    Virtualization type: hvm    ENA Enabled: Yes

Select

64-bit



**Red Hat**  
Free tier eligible

### Red Hat Enterprise Linux 7.5 (HVM), SSD Volume Type - ami-28e07e50

Red Hat Enterprise Linux version 7.5 (HVM), EBS General Purpose (SSD) Volume Type

Root device type: ebs    Virtualization type: hvm    ENA Enabled: Yes

Select

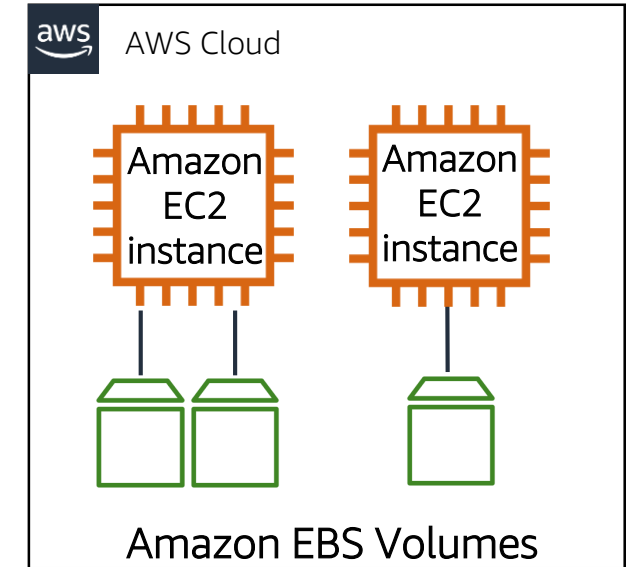
64-bit



# Store your data

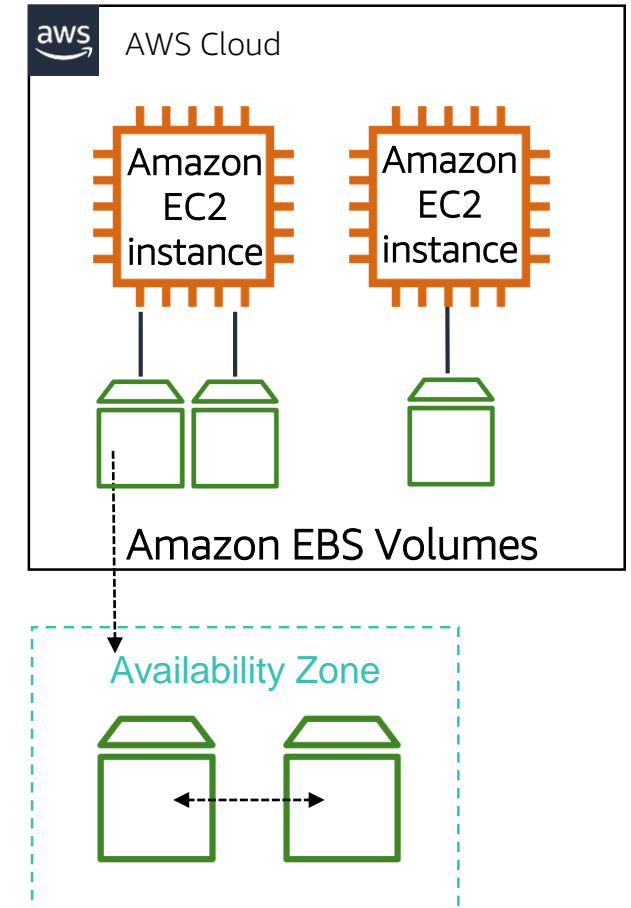
# Amazon Elastic Block Store (Amazon EBS)

- Persistent block storage for instances



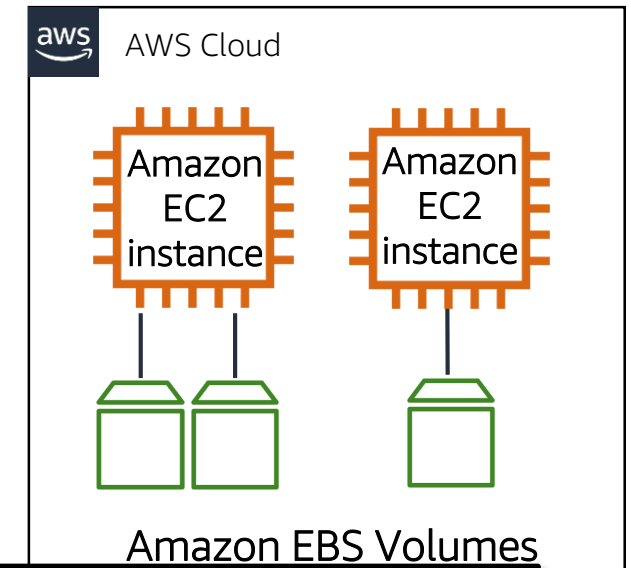
# Amazon Elastic Block Store (Amazon EBS)

- Persistent block storage for instances
- Protected through replication



# Amazon Elastic Block Store (Amazon EBS)

- Persistent block storage for instances
- Protected through replication
- Different drive types



## Solid State Drives (SSD)

Provisioned IOPS SSD (io1) Volumes

General Purpose SSD (gp2) Volumes

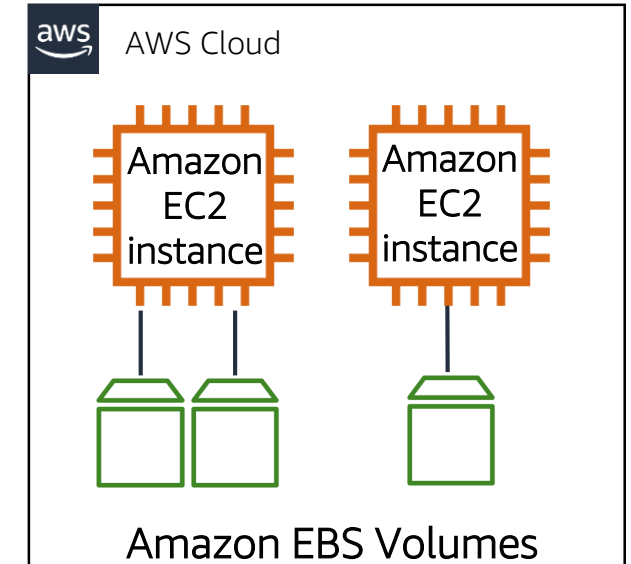
## Hard Disk Drives (HDD)

Throughput Optimized HDD (st1) Volumes

Cold HDD (sc1) Volumes

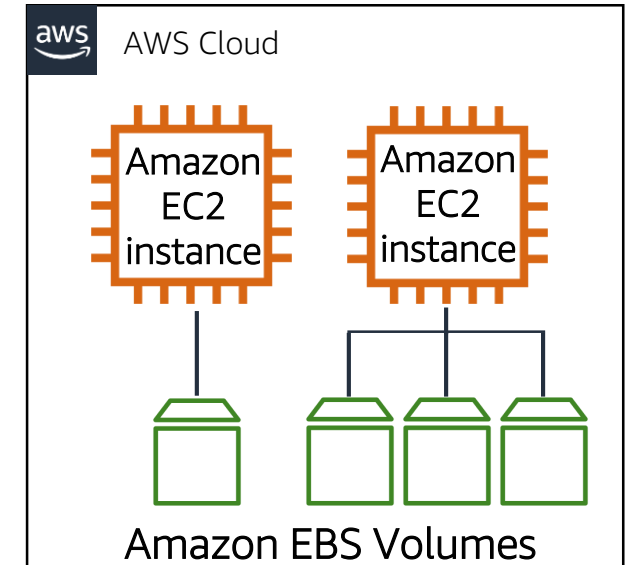
# Amazon Elastic Block Store (Amazon EBS)

- Persistent block storage for instances
- Protected through replication
- Different drive types
- Scale up or down in minutes



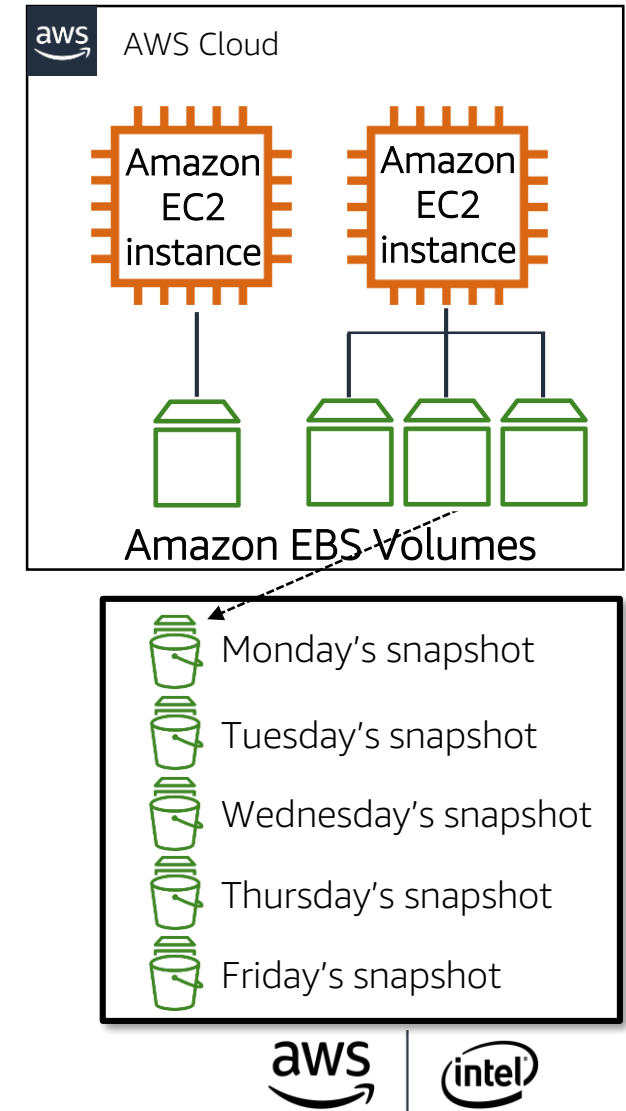
# Amazon Elastic Block Store (Amazon EBS)

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



# Amazon Elastic Block Store (Amazon EBS)

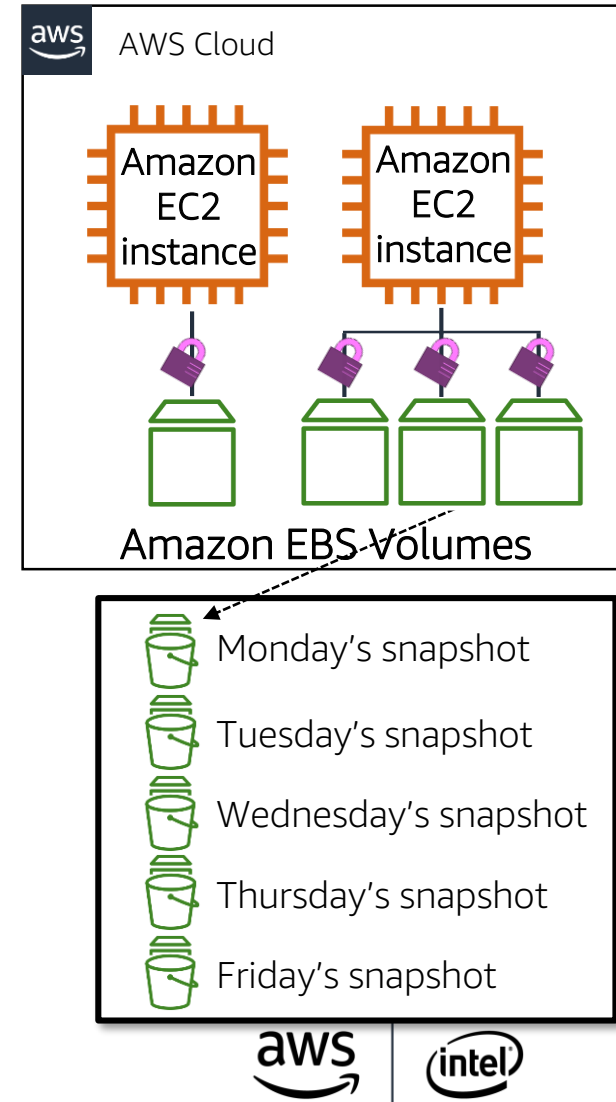
- Persistent block storage for instances
- Protected through replication
- Different drive types
- Scale up or down in minutes
- Pay for only what you provision
- Snapshot functionality



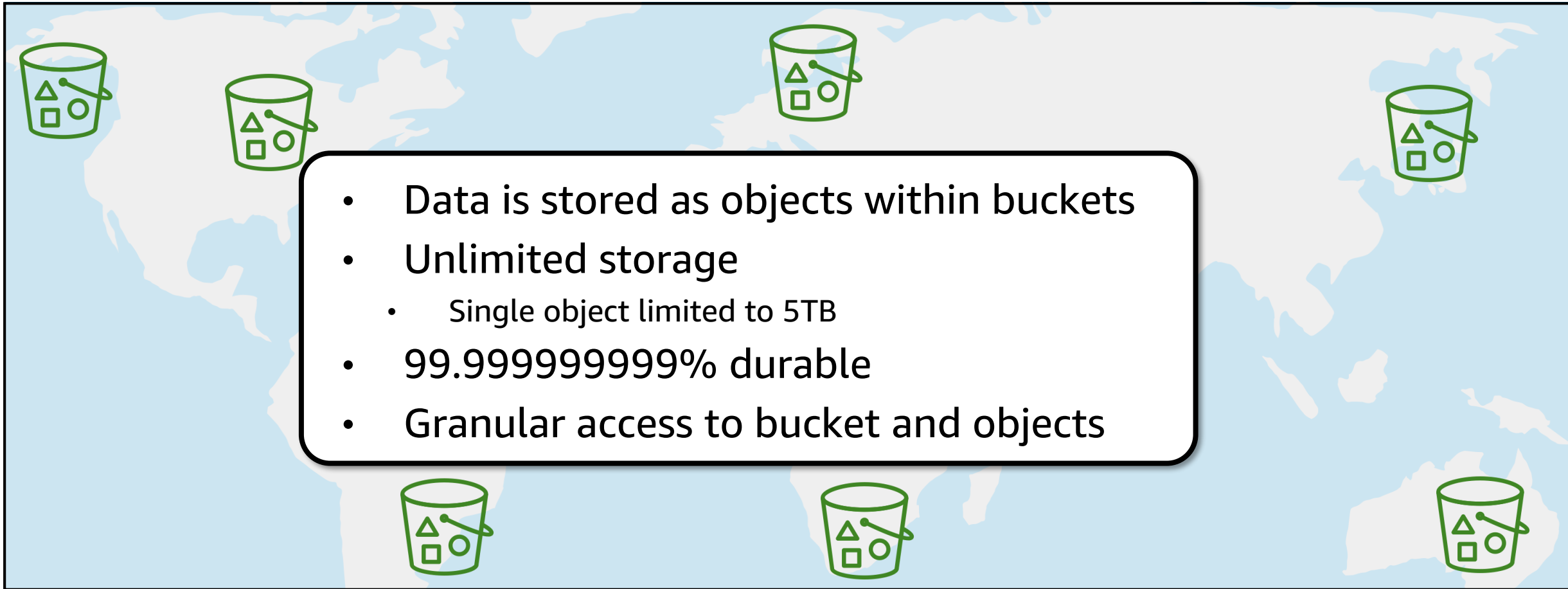


# Amazon Elastic Block Store (Amazon EBS)

- 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



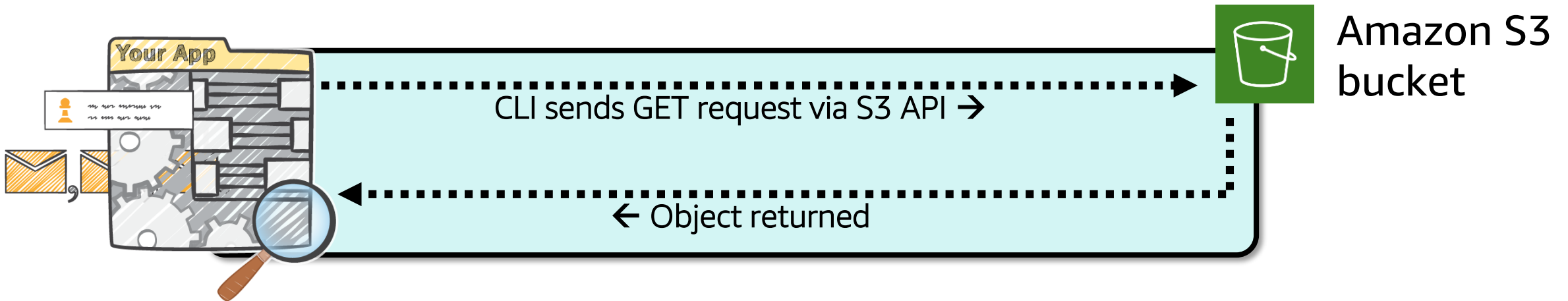
# What is Amazon S3?



- Data is stored as objects within buckets
- Unlimited storage
  - Single object limited to 5TB
- 99.999999999% durable
- Granular access to bucket and objects

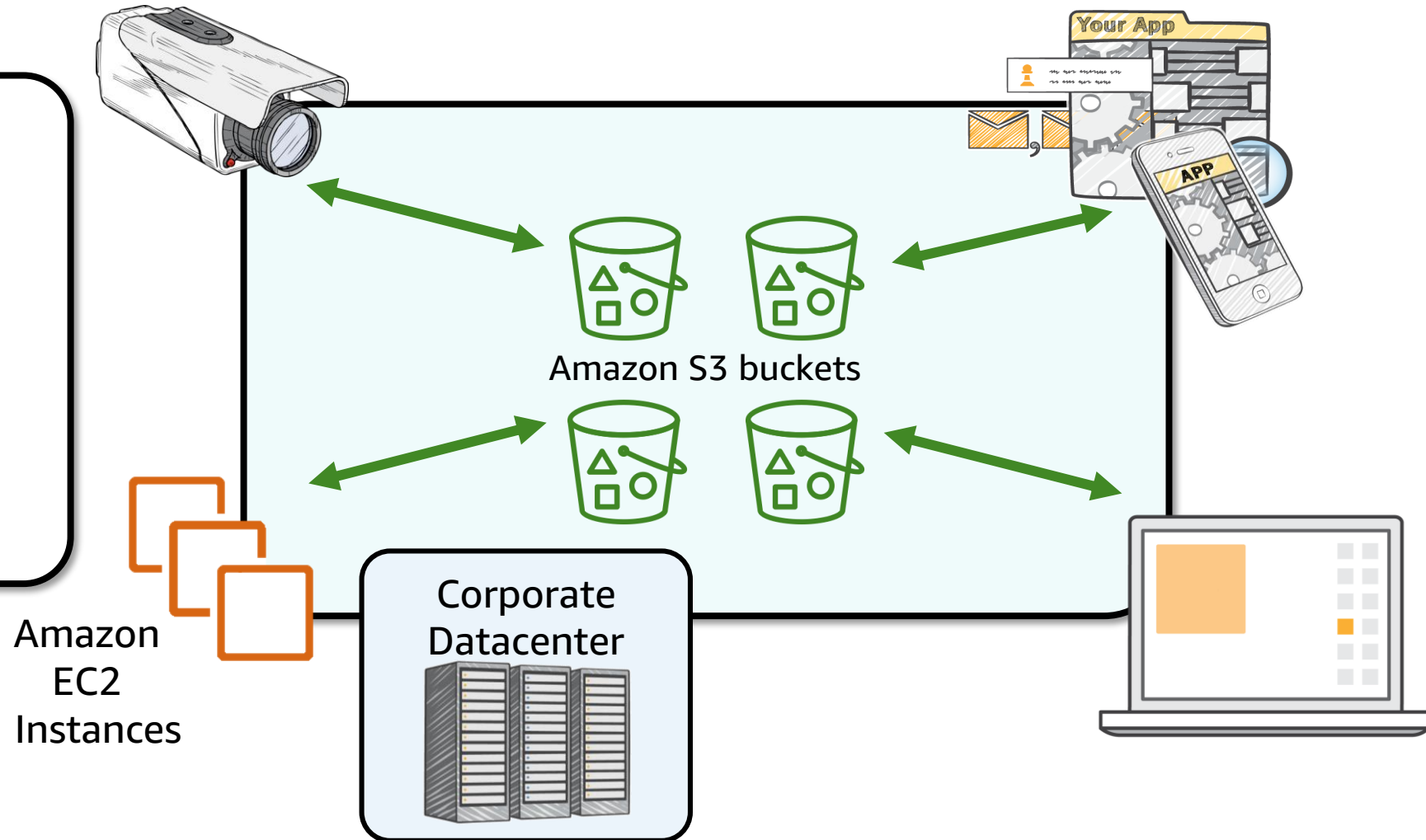
# Amazon S3 core functionality

- Fast, durable, highly available key-based access to objects
- Object storage built to store and retrieve data
- Not a file system



# Amazon S3 common scenarios

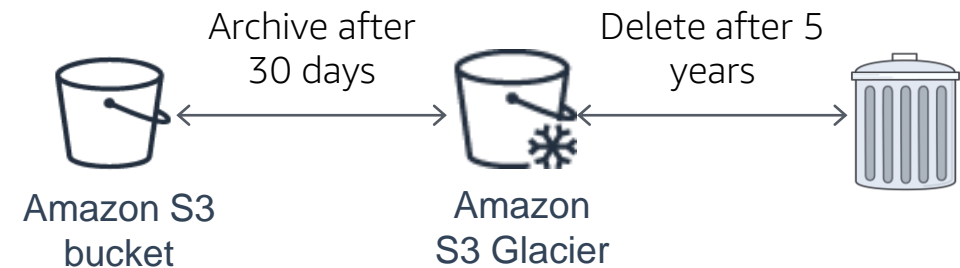
- Backup and storage
- Application hosting
- Media hosting
- Software delivery



# Demo

# What is Amazon S3 Glacier?

- Low-cost data archiving and long-term backup
- 3- to 5-hour or within 12 hours\*
- Can configure lifecycle archiving of Amazon S3 content to Amazon Glacier



# Amazon S3 Glacier use cases



Media asset workflows



Healthcare information archiving



Regulatory and compliance archiving



Scientific data storage

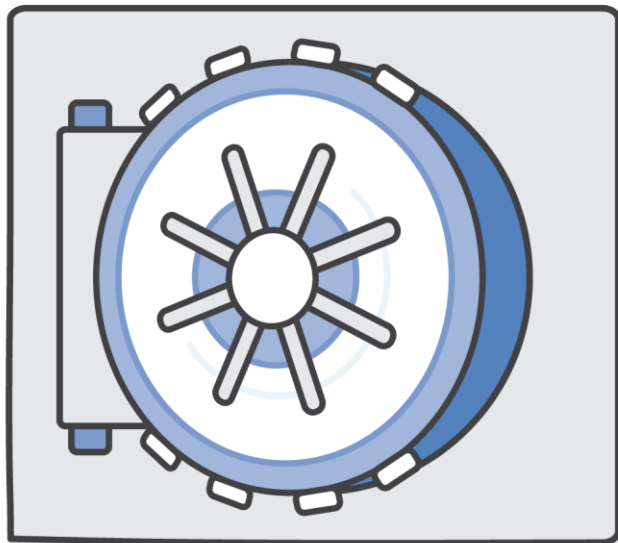


Digital preservation



Magnetic tape replacement

# Amazon S3 Glacier vault lock policy



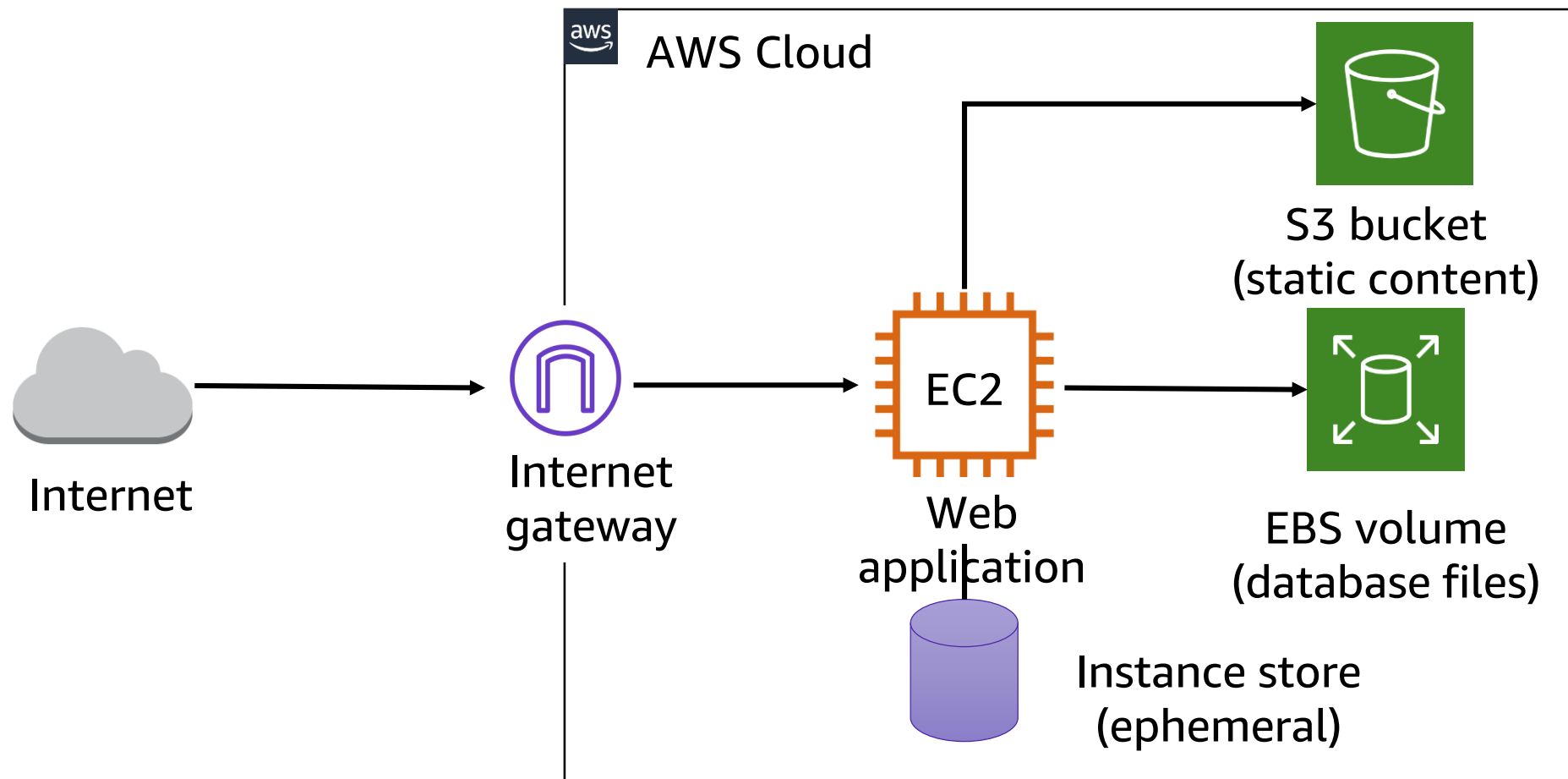
- Deploy and enforce compliance controls on individual Amazon Glacier vaults
- Vault becomes immutable once locked



# Amazon S3 storage classes

Storage class	Features
S3 Standard	<ul style="list-style-type: none"><li>• <math>\geq 3</math> availability zones</li></ul>
S3 Standard - Infrequent Access (IA)	<ul style="list-style-type: none"><li>• Retrieval fee associated with objects</li><li>• Most suitable for infrequently accessed data</li></ul>
S3 Intelligent- Tiering	<ul style="list-style-type: none"><li>• Automatically moves objects between tiers based on access patterns</li><li>• <math>\geq 3</math> availability zones</li></ul>
S3 One Zone-IA	<ul style="list-style-type: none"><li>• 1 availability zone</li><li>• Costs 20% less than S3 Standard-IA</li></ul>
S3 Glacier	<ul style="list-style-type: none"><li>• Not available for real-time access</li><li>• Must restore objects before you can access them</li><li>• Restoring objects can take 1 minute - 12 hours</li></ul>
S3 Glacier Deep Archive	<ul style="list-style-type: none"><li>• Lowest cost storage for long term retention (7-10 years)</li><li>• <math>\geq 3</math> availability zones</li><li>• Retrieval time within 12 hours</li></ul>

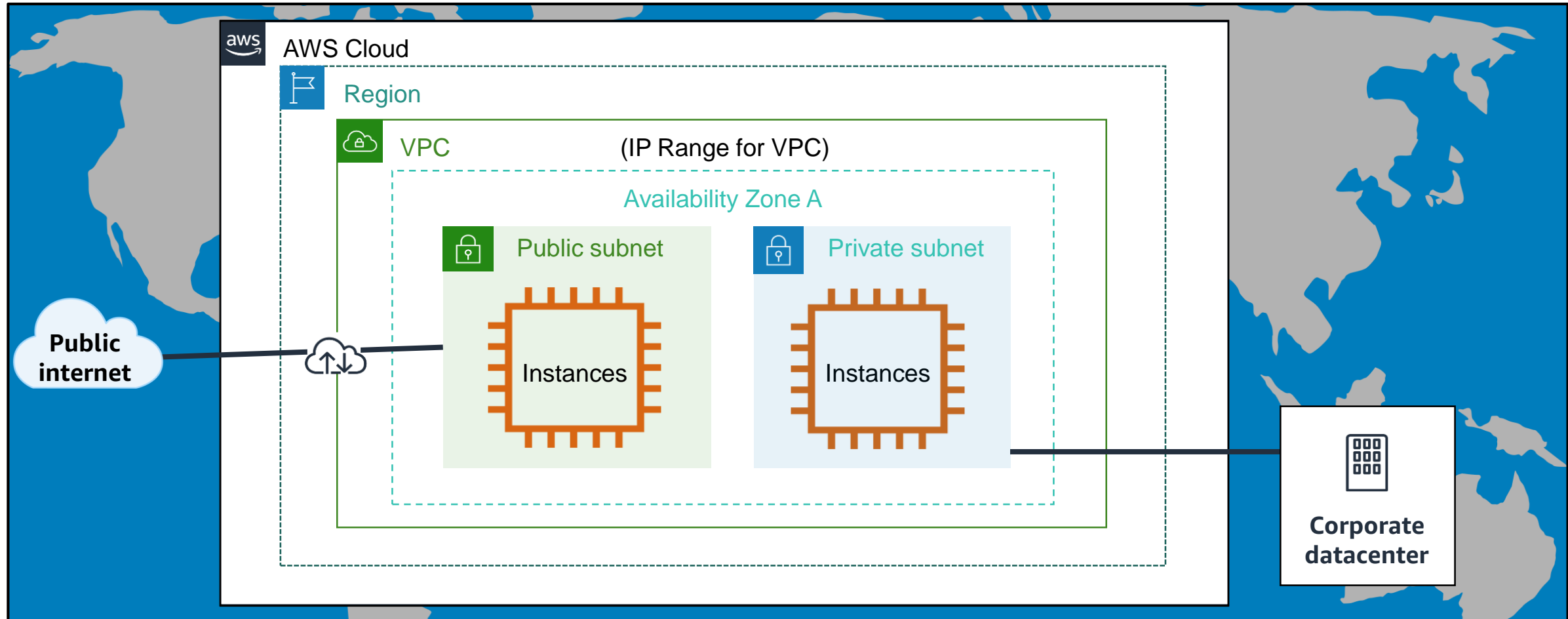
# Architecture example



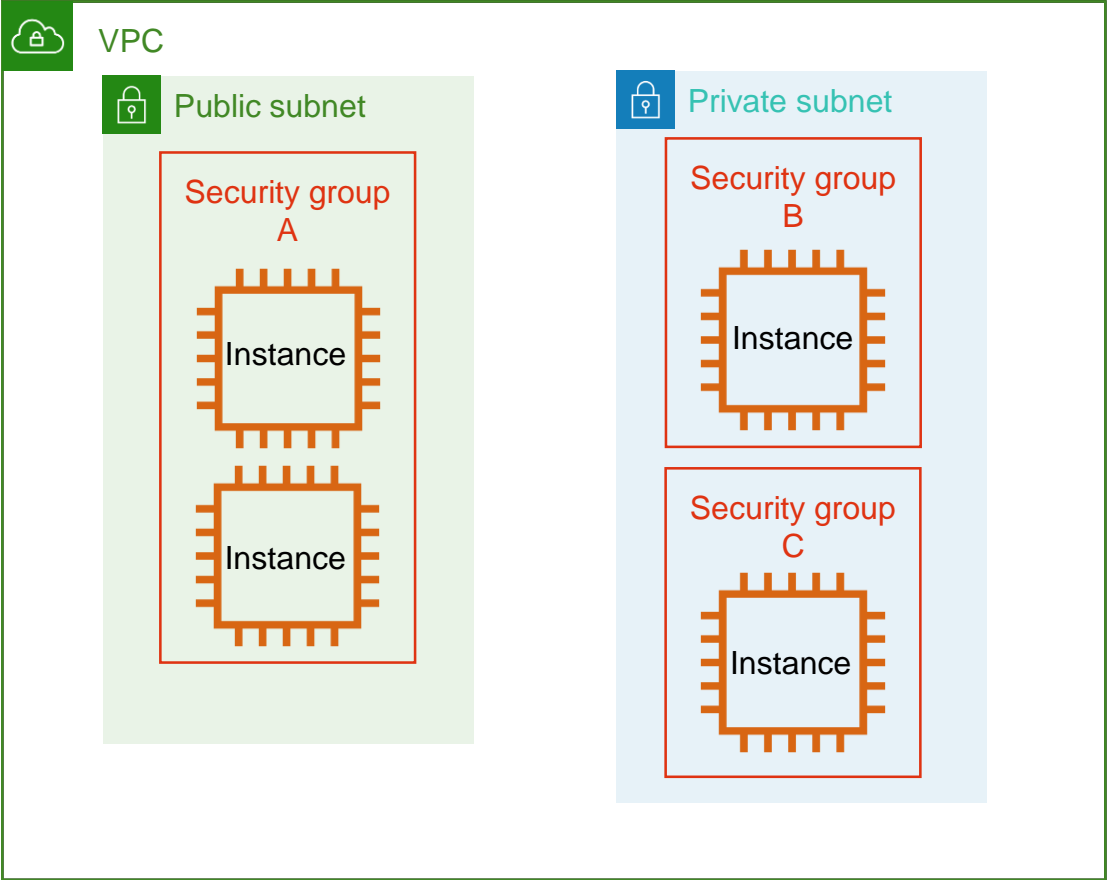


# Secure your data

# Amazon Virtual Private Cloud (Amazon VPC)



# Security groups

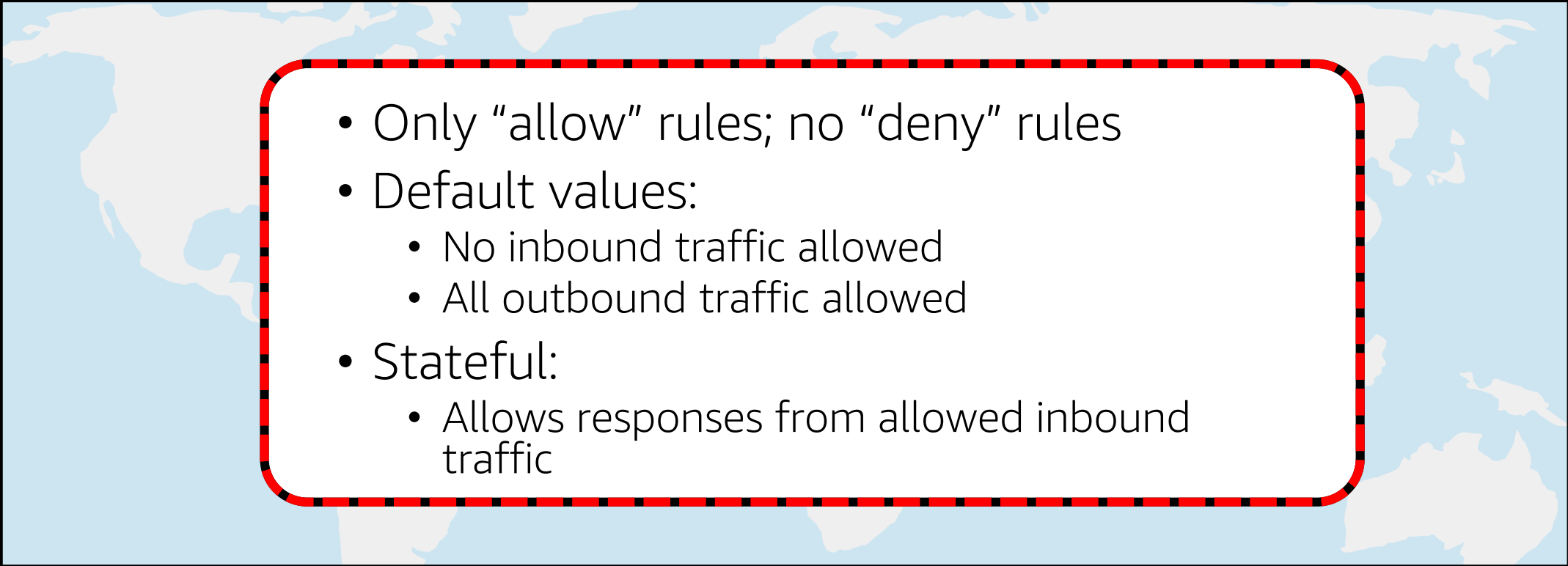


Security Group A		
Inbound		
Source	Protocol	Port Range
0.0.0.0/0	TCP	80
0.0.0.0/0	TCP	443

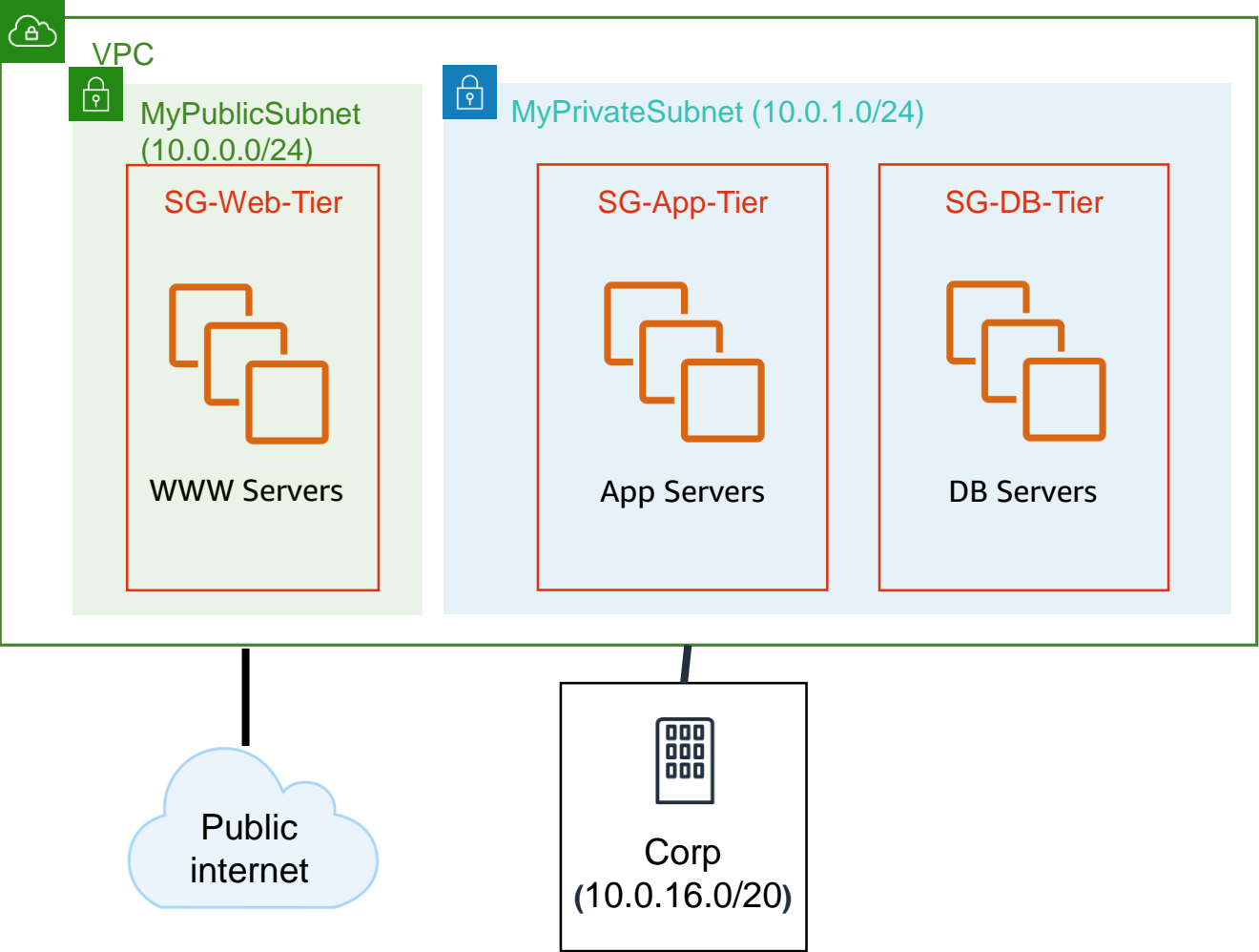
Security Group-B		
Inbound		
Source	Protocol	Port Range
10.0.1.0/24	TCP	22

Security Group-C		
Inbound		
Source	Protocol	Port Range
ID of Security Group B	All	All

# Security group details

- 
- Only “allow” rules; no “deny” rules
  - Default values:
    - No inbound traffic allowed
    - All outbound traffic allowed
  - Stateful:
    - Allows responses from allowed inbound traffic

# Security groups example



Inbound		
Source	Protocol	Port Range
0.0.0.0/0	TCP	80
0.0.0.0/0	TCP	443
10.0.16.0/20	TCP	22

SG-Web-Tier

Inbound		
Source	Protocol	Port Range
ID of SG-Web-Tier	TCP	6455
10.0.16.0/20	TCP	22

SG-App-Tier

Inbound		
Source	Protocol	Port Range
ID of SG-App-Tier	TCP	3306
10.0.16.0/20	TCP	22

SG-DB-Tier

# End of Module 2

## Test Your Knowledge