# Introduction to Amazon Cloud

## Amazon EC2 and Spot Overview

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Amazon Web Services

# Agenda

- Introduction to Amazon Cloud
- AWS Global Reach
- Amazon EC2 Overview
- Amazon EC2 Spot Overview

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# What is cloud computing?

- Cloud computing is the on-demand delivery of IT resources and applications over the Internet with pay-as-you-go pricing.

# What is AWS?

- AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud that powers millions of businesses in over 245 countries and territories around the world.

- Benefits
  - Low Cost
  - Elasticity & Agility
  - Open & Flexible
  - Secure
  - Global Reach

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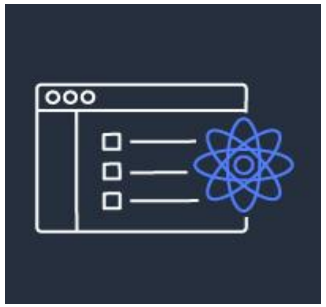
# How AWS can help your research

Science, not servers

Use compute when you need it to do large-scale analysis

Collaboration

Access data sets that span institutions



Share effort

Leverage work done by other scientists to save time

Reproduce research

A common platform for reproducing scientific analyses

State-of-the-art analytics

Use data science methods in your research

Security

A collection of tools to protect data and privacy

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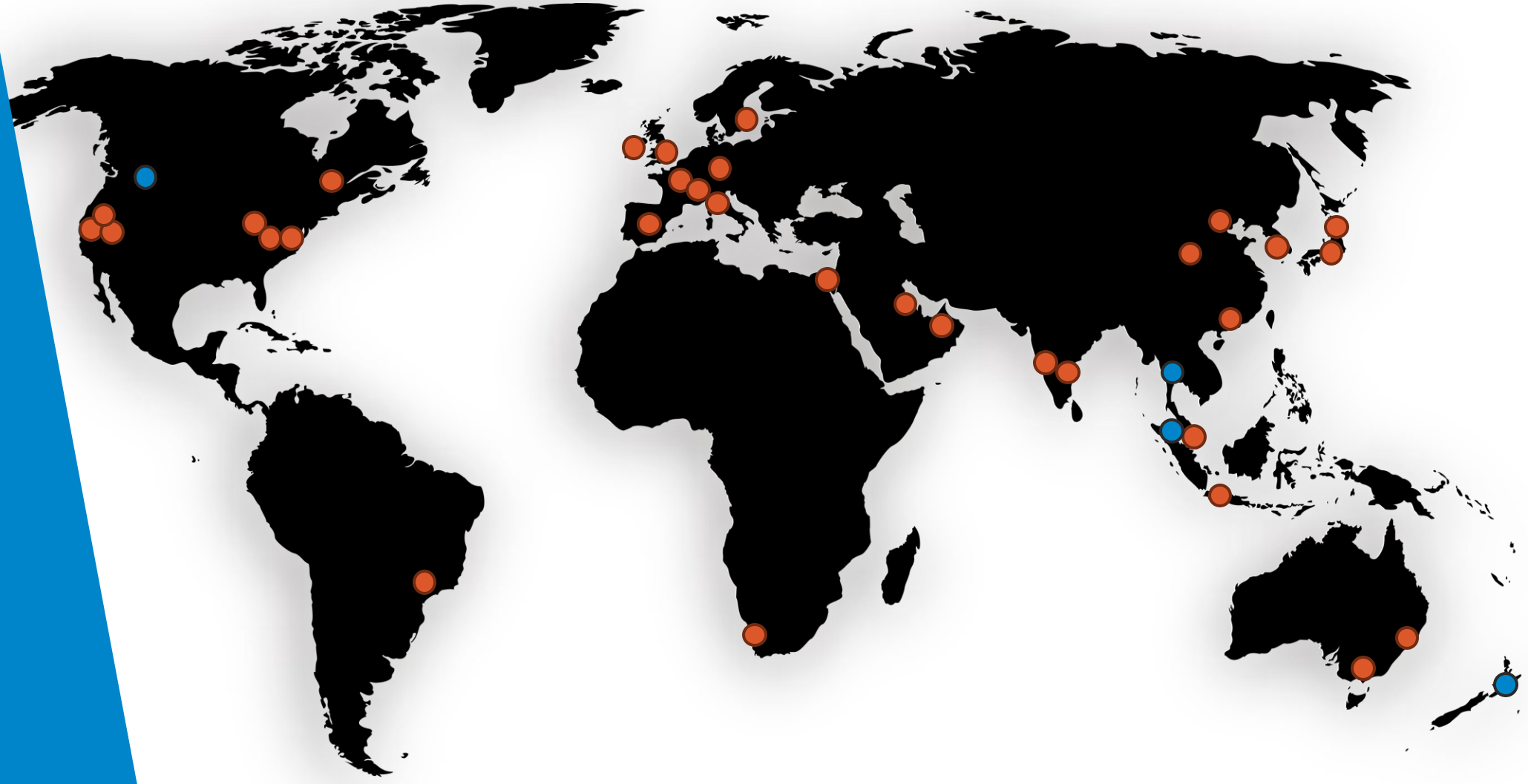
# AWS Global Reach

# 32 Regions



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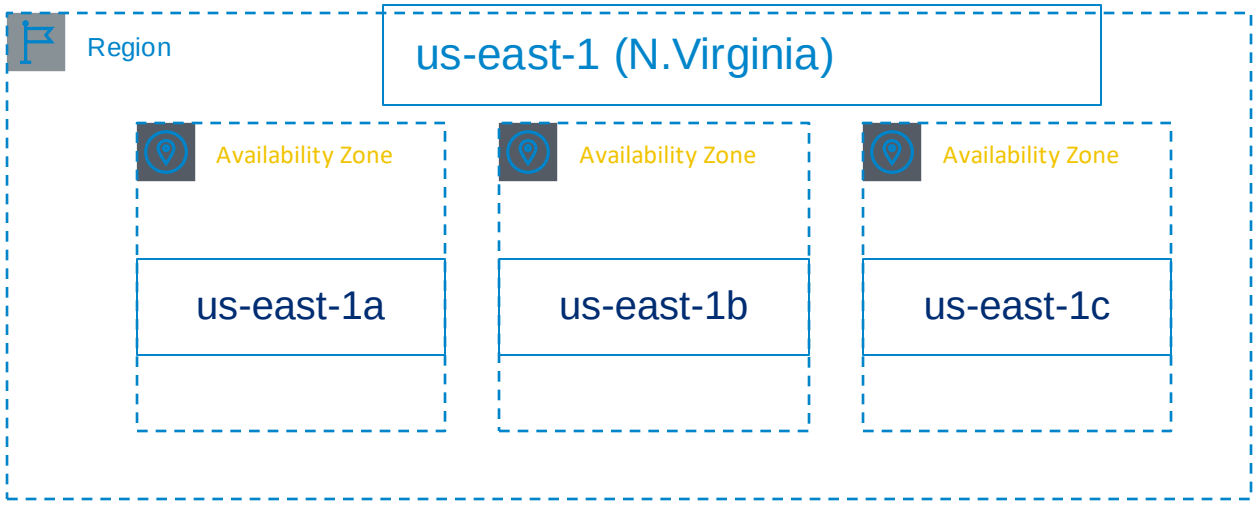
# Availability Zones

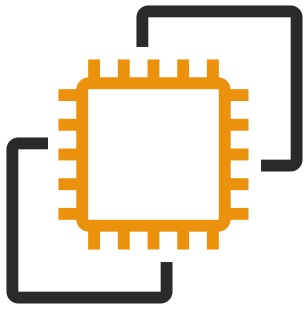
- Each AWS Region consists of multiple, isolated, and physically separate AZs within a geographic area
- An Availability Zone (AZ) is one or more discrete data centers with redundant power, networking, and connectivity in an AWS Region
- High throughput, low latency (< 10 ms) network between Availability Zones
- All traffic between AZs is encrypted
- Physical separation with 100 km (60 miles)



# Amazon EC2 Overview

# Amazon Elastic Compute Cloud (Amazon EC2)

## Virtual server instances in the cloud



AMAZON EC2

Linux | Windows | Mac

Arm and x86 architectures

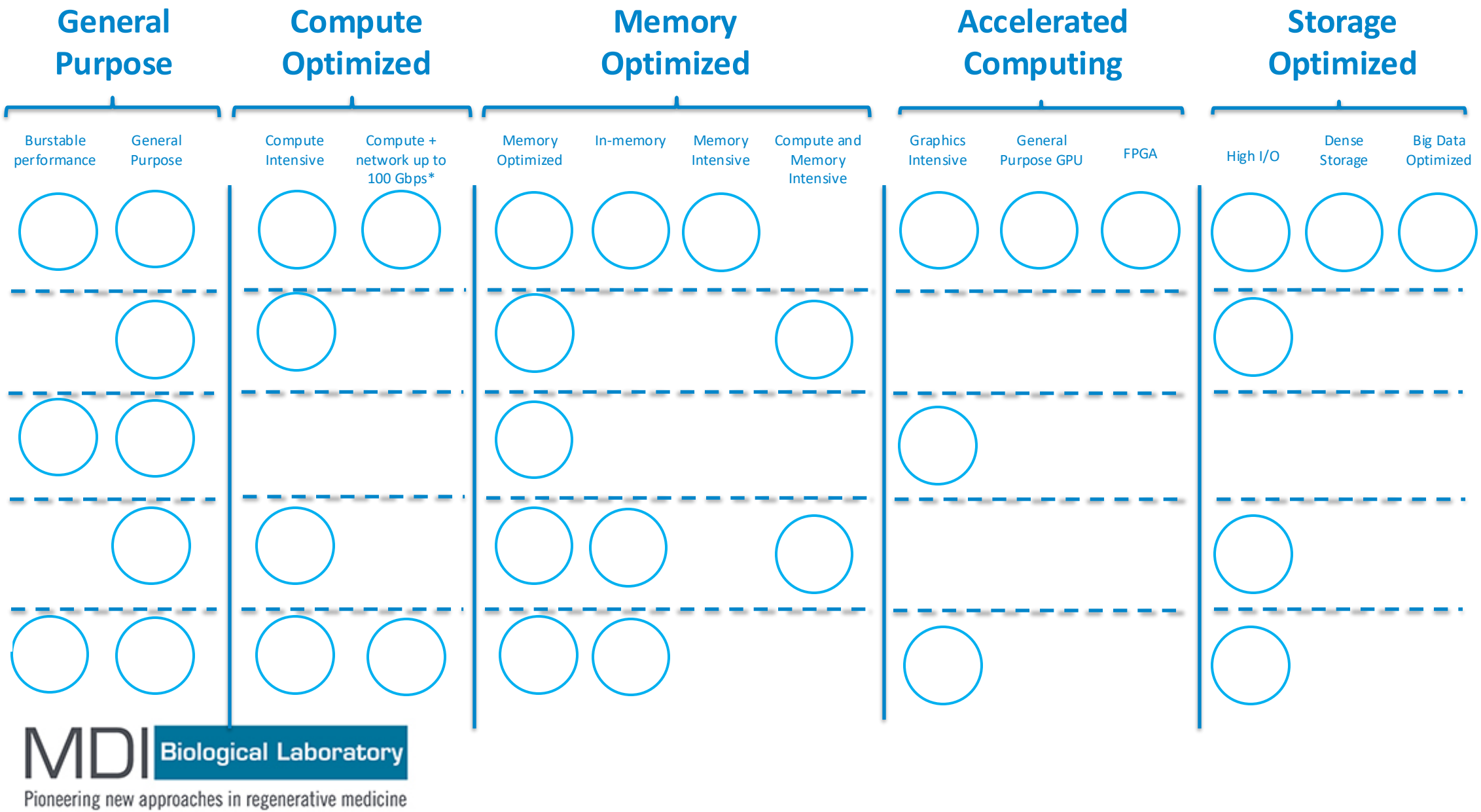
General purpose and workload optimized

Bare metal, disk, networking capabilities

Packaged | Custom | Community AMIs

Multiple purchase options: On-Demand, Spot instances, Reserved Instances, Savings Plans, Dedicated Hosts

# Instance Types

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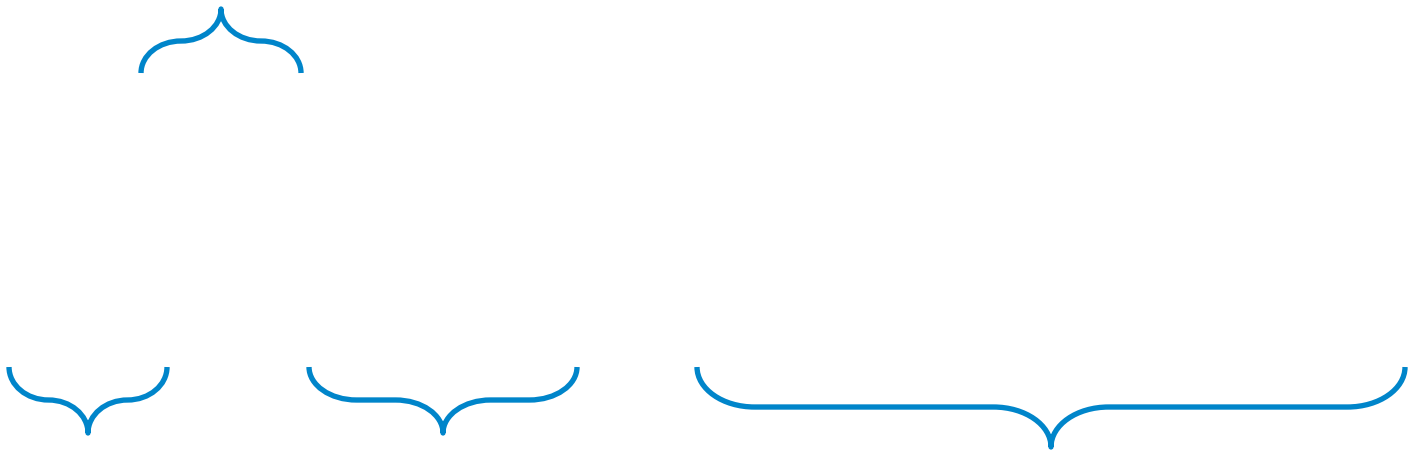
# Instance Naming



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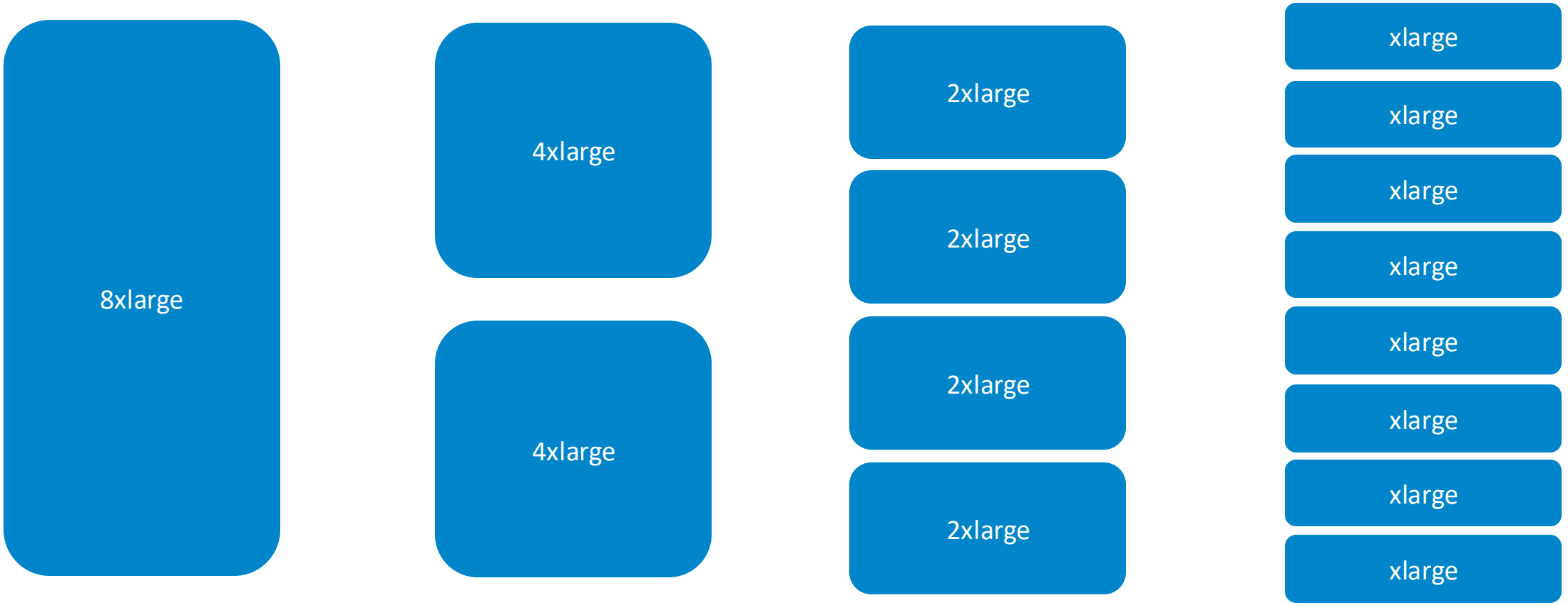
# Instance Sizing



# Choose your processor and architecture

Inte

Right compute for the right application and workload

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# What's a virtual CPU? (vCPU)

- A vCPU is typically a hyper-threaded physical core*
- Divide vCPU count by 2 to get core count
- On Linux, "A" threads enumerated before "B" threads
- On Windows, threads are interleaved

- Cores by Amazon EC2 & RDS DB Instance type: https://aws.amazon.com/ec2/physicalcores/

- * *CPU Optimizing options allow disabling hyperthreading and reduce number of cores*

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# Memory and Storage

## What's a GiB?

- Memory is presented as GibiBytes (GiB) and not Gigabytes (GB)
- 256 GiB = 275 GB

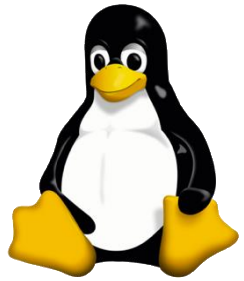
## What about storage?

- Storage is independent of compute
- You allocate drives known as Amazon Elastic Block Store (EBS) volumes
- Amazon EBS volumes support up to 64 TiB per volume
- Some instance types provide physically attached (ephemeral) storage

# EC2 Operating Systems

- Windows Server 2012/2012 R2/2016/2019/2022
- Amazon Linux (NEW: Amazon Linux 2023)
- Debian
- SUSE
- CentOS
- Red Hat Enterprise Linux (RHEL)
- Ubuntu
- Mac, including M1 Mac instances

- Visit the AWS Marketplace for more Operating Systems



# What is an Amazon Machine Image (AMI)?

- Provides the information required to launch an instance
- Launch multiple instances from a single AMI with the same configuration
- An AMI includes the following:
  - One or more Amazon Elastic Block Store (Amazon EBS) snapshots, or a template for the root volume (operating system, applications)
  - Launch permissions that control which AWS accounts can use the AMI
  - Block device mapping that specifies volumes to attach to the instance

# Amazon EC2 purchase options

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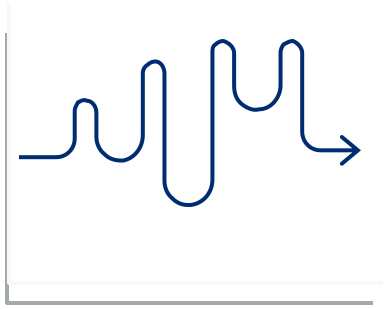
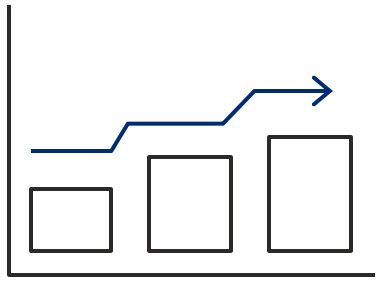
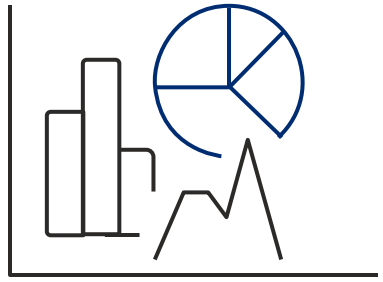


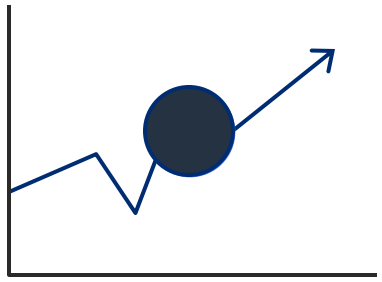
significant discount



more flexibility



savings of up to 90%



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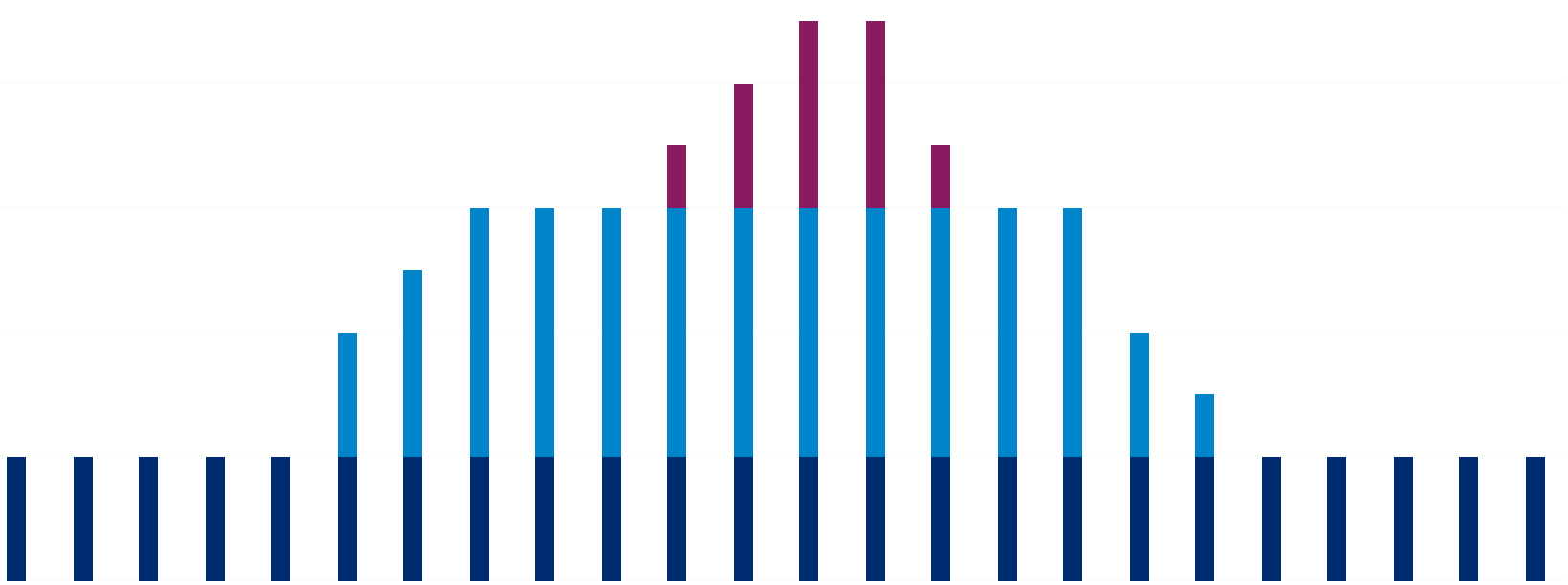
# Simplifying capacity and cost optimization



SCALE USING **SPOT**
FOR FLEXIBLE,
FAULT-TOLERANT WORKLOADS

SCALE USING **ON-DEMAND**
FOR NEW OR STATEFUL SPIKY
WORKLOADS

USE **RIs** AND **SAVINGS PLANS**
FOR KNOWN/
STEADY-STATE WORKLOADS

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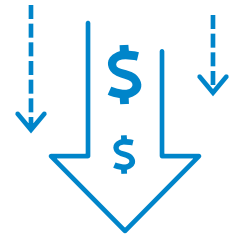
# Amazon EC2 Spot Overview

# Amazon EC2 Spot

Spare Amazon EC2 capacity with savings of up to 90% over On Demand



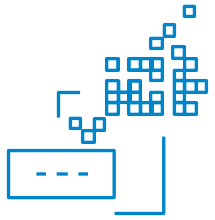
**Faster results**

Increase throughput up to 10x while staying in budget

**Easy to use**

Launch through AWS services or integrated third-parties

Spot is ideal for workloads such as



Big data

Simulations

AI/ML Training

HPC

Spot is ideal for:

- Fault-tolerant
- Flexible
- Loosely coupled
- Stateless workloads

Or containerized workloads

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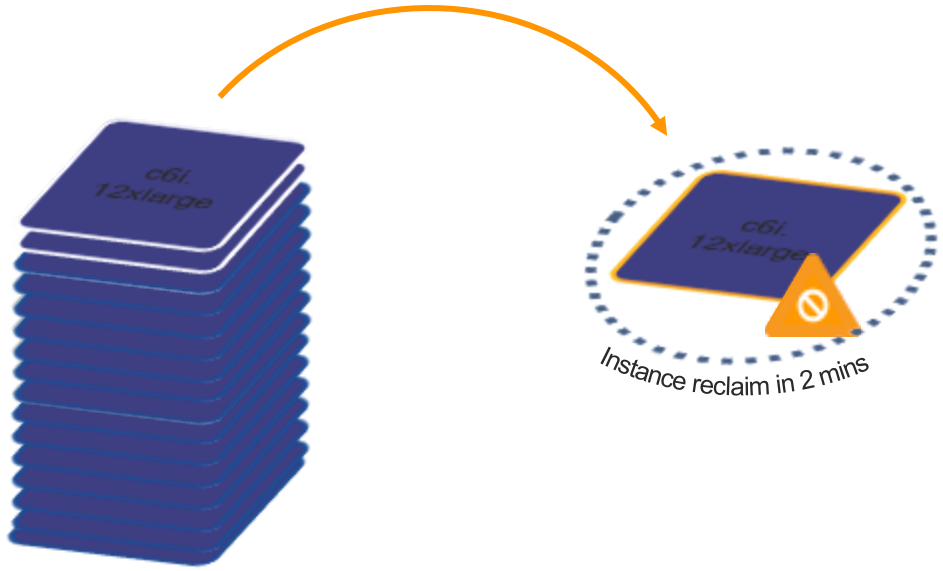
# EC2 Spot Interruptions

- By the nature of Spot as spare-capacity, instances can be reclaimed if needed by On-Demand
- AWS provides 2-minute notifications to enable you to handle the response in an automated way
- Diversification across instances reduces interruptions

- Historically, ***95%*** of the Spot instances launched in the last 3 months completed without interruption

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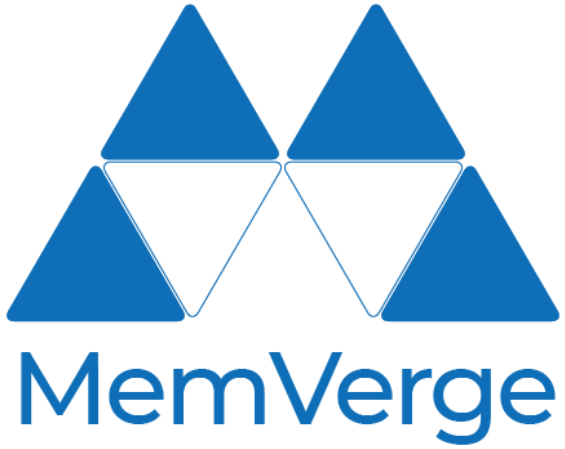
# A better way to leverage Spot?

- An up to 90% discount on EC2 is great, but you won't see cost benefits if you have to re-run your job after Spot reclamations
- Not all software comes with memory checkpointing built-in
- 3rd Party AWS Partners, like MemVerge, provide software to solve this problem

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# Thank you!

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