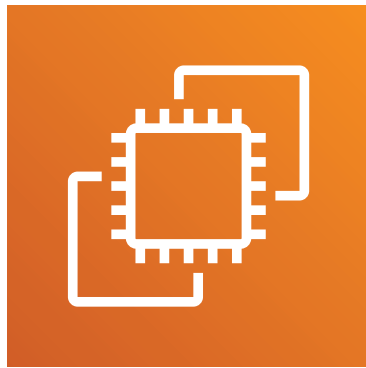# Compute Services

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# Compute Services

A service that enables you to leverage cloud-based virtual machines for workloads. This could be serving web content to visitors, running a database, or calculating statistics from a data set.

# Compute Services on AWS

**Amazon EC2**

Provides secure and resizable virtual servers on AWS

**AWS Elastic Beanstalk**

Platform for scaling and deploying web apps and services

**AWS Lambda**

Enables compute without managing servers

# Overview

Introducing Amazon EC2 capabilities

Exploring pricing approaches for EC2 instances

Introducing the capabilities of AWS Elastic Beanstalk

Reviewing use cases for Elastic Beanstalk

Introducing AWS Lambda

# Amazon EC2 Overview

"Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers."

**Amazon Web Services**

# Amazon EC2
# Use Cases

Web application hosting

Batch processing

Web services endpoint

Desktop in the cloud

# Amazon EC2 Concepts

Instance Types

Root Device Type

Amazon Machine Image (AMI)

Purchase Options

# Amazon EC2 Instance Types

**Defines the processor, memory, and storage type**

**Cannot be changed without downtime**

**Provided in the following categories**

- General purpose

- Compute, memory, and storage optimized

- Accelerated computing

**Pricing is based on instance type**

**Some instance types have unique capabilities**

# Example EC2 Instance Type Pricing

|  | vCPU | Memory | Linux Pricing |
|---|---|---|---|
| **t3.medium** | 2 | 4 GiB | $0.0416 per Hour |
| **m5.large** | 4 | 16 GiB | $0.096 per Hour |
| **c5d.24xlarge** | 96 | 375 GiB | $4.608 per Hour |
| **p3.16xlarge** | 64 | 488 GiB | $24.48 per Hour |
| **i3.16xlarge** | 64 | 488 GiB | $4.992 per Hour |

# Root Device Type

## Instance Store

Ephemeral storage that is physically attached to the host the virtual server is running on

## Elastic Block Store (EBS)

Persistent storage that exists separately from the host the virtual server is running on

# Amazon Machine Image (AMI)

Template for an EC2 instance including configuration, operating system, and data

AWS provides many AMI's that can be leveraged

AMI's can be shared across AWS accounts

Custom AMI's can be created based on your configuration

Commercial AMI's are available in the AWS Marketplace

# Amazon EC2 Purchase Types

# Amazon EC2 Purchase Options

**On-Demand**

**Reserved**

**Savings Plan**

**Spot**

**Dedicated**

# Reserved Instances

Provides discounts over the on-demand model when you can commit to a specific period of time. In addition, it provides a capacity reservation for the specific instance type that you specify.

# EC2 Reserved Instance Types

## Standard
Highest discount, works for steady workloads

## Convertible
Enables the conversion of attributes, works for steady workloads

## Scheduled
Works for a time window you reserve, good for a predictable workload

# Standard Reserved Instance Cost Models

## All Upfront

Entire cost for the 1 or 3 year period is paid upfront

## Partial Upfront

Part of 1 or 3 year cost is paid upfront along with a reduced monthly cost

## No Upfront

No upfront payment is made, but there will be a reduced monthly cost

Maximum
Savings

Minimum
Upfront Cost

# Savings Plans

Similar in concept to reserved instances

Supports compute with EC2, Fargate, and Lambda

Unlike Reserved Instances, it does not reserve capacity

Provide savings of up to 72%

Comes in 1 or 3 year terms

**Spot instances** enable you to leverage excess EC2 compute capacity.

# Spot Instances

Can provide up to 90% discount over on-demand pricing

There is a market price for instance types per availability zone called the Spot price

When you request instances, if your bid is higher than Spot price they will launch

If the Spot price grows to exceed your bid, the instances will be terminated

Spot instances can be notified 2 minutes prior to termination

# Dedicated Host

The dedicated host pricing model gives you a dedicated physical server.  It will be the most expensive option, but it may be required for either server software licensing or due to a compliance requirement.

# Amazon EC2 Purchase Options

If you have an instance that is consistent and always needed, you should purchase a Standard or Convertible Reserved Instance.

If you have batch processing where the process can start and stop without affecting the job, you should leverage Spot Instances.

If you have an inconsistent need for instances that cannot be stopped without affecting the job, leverage On-Demand Instances.

# Amazon EC2 Purchase Options

If you have specific per-server licensing or if you have a compliance requirement for a dedicated server, you should use Dedicated Host

If you are leveraging Lambda and/or Fargate alongside EC2 and want to achieve discounts for 1 or 3 years, choose a Savings Plan

If you have a predictable but not steady workload in EC2, you should purchase a Scheduled Reserved Instance.

# Reserved Instance EC2 Pricing Example

|  | On-Demand | All Upfront | Effective Hourly | Savings |
|---|---|---|---|---|
| **t3.medium** | $0.0416 per Hour | $213.00 (1 Year)<br>$412.00 (3 Years) | $0.024 (1 Year)<br>$0.015 (3 Years) | $151.42 (1 Year)<br>$681.25 (3 Years) |
|  | **On-Demand** | **Partial Upfront (1 Yr)** | **Effective Hourly** | **Savings** |
| **c5d.24xlarge** | $4.608 per Hour | $12,124 (Upfront)<br>$1,010.32 (Monthly) | $2.768 | $16118.40 (40%) |
|  | **On-Demand** | **No Upfront (3 Yr)** | **Effective Hourly** | **Savings** |
| **i3.16xlarge** | $4.992 per Hour | $1,765.87 (Monthly) | $2.419 | $22539.48 (52%) |

# Spot Instance EC2 Pricing Example

|  | On-Demand | Spot Pricing | Percentage Savings |
|---|---|---|---|
| **t3.medium** | $0.0416 per Hour | $0.0125 per Hour | 70% |
| **c5d.24xlarge** | $4.608 per Hour | $0.9122 per Hour | 80% |
| **i3.16xlarge** | $4.992 per Hour | $1.4976 per Hour | 70% |

# Launching EC2 Instances

# Demo

Launching a new EC2 instance based on an AWS AMI

Exploring the EC2 launch wizard in the AWS Console

Configuring EC2 instance to be used as a web server

Terminating an EC2 instance

# AWS Elastic Beanstalk Overview

# AWS Elastic Beanstalk

Automates the process of deploying and scaling workloads on EC2 (PaaS)

Supports a specific set of technologies

Leverages existing AWS services

Only pay for the other services you leverage

Handles provisioning, load balancing, scaling, and monitoring

Java

.NET

PHP

Node.js

Python

Ruby

Go

Docker

Supported Application
Platforms

# Elastic Beanstalk Features

| Monitoring | Deployment |
|---|---|
| Scaling | EC2 Customization |

# Use Cases

Deploy an application with minimal knowledge of other services

Reduce the overall maintenance needed for the application

Few customizations are required

# Launching an App on Elastic Beanstalk

# Demo

Accessing the sample Elastic Beanstalk applications

Launching a sample application on Elastic Beanstalk

Deleting a deployed Elastic Beanstalk application

# AWS Lambda Overview

"**AWS Lambda** lets you run code without provisioning or managing servers. You pay only for the compute time you consume. You can run code for virtually any type of application or backend service - all with zero administration."

Amazon Web Services

# AWS Lambda

Enables the running of code without provisioning infrastructure

Only charged for usage based on execution time

Can configure available memory from 128 MB to 3008 MB

Integrates with many AWS services

Enables event-driven workflows

Primary service for serverless architecture

**Reduced maintenance requirements**

**Enables fault tolerance without additional work**

**Scales based on demand**

**Pricing is based on usage**

AWS Lambda Advantages

# Scenario Review

# Scenario 1

Sylvia's company is in the process of moving multiple workloads into AWS

One workload is an application that will be leveraged for at least 5 more years

The organization is looking to be as cost efficient as possible for its EC2 usage

What EC2 purchase option should be chosen for this application?

# Scenario 2

Edward is looking to deploy his PHP web application to a virtual server

He doesn't have experience managing EC2 instances on AWS

He needs the ability to scale this application to meet user demand

What is the best compute option for Edward based on this criteria?

# Scenario 3



Cindy's company is transitioning to the cloud for its data processing workloads

These workloads happen daily and can start or stop without a problem

This workload will be leveraged for at least one year

What EC2 purchase option would be the most cost efficient choice?

# Summary

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Introduced AWS Lambda

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**Solution:** All Upfront Reserved - 3 Years

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**Solution:** AWS Elastic Beanstalk

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**Solution:** Spot Instances