# AWS Solution Architect Associate Certification Training – Module 7

## 7. Pricing Models & Billing

**Introduction to Pricing Models of EC2 Instances**

Amazon EC2 is free to try. There are four ways to pay for Amazon EC2 instances: On-Demand, Reserved Instances, and Spot Instances. You can also pay for Dedicated Hosts which provide you with EC2 instance capacity on physical servers dedicated for your use.

**Free tier**

AWS Free Tier includes 750 hours of Linux and Windows t2.micro instances each month for one year. To stay within the Free

Tier, use only EC2 Micro instances.

**On-demand Instances Model**

With On-Demand instances you only pay for EC2 instances you use. The use of On-Demand instances frees you from the costs and complexities of planning, purchasing, and maintaining hardware and transforms what are commonly large fixed costs into much smaller variable costs. On-Demand instances let you pay for compute capacity by the hour or second (minimum of 60 seconds) with no long-term commitments. This frees you from the costs and complexities of planning, purchasing, and maintaining hardware and transforms what are commonly large fixed costs into much smaller variable costs.

**On-Demand instances are recommended for:**

- Users that prefer the low cost and flexibility of Amazon EC2 without any up-front payment or long-term commitment.
- Applications with short-term, spiky, or unpredictable workloads that cannot be interrupted.
- Applications being developed or tested on Amazon EC2 for the first time

The below is the pricing for the EC2 with Linux as operating system in North Virginia for some of the Instance types which is on-demand

Region: US East (N. Virginia)

| | vCPU | ECU | Memory (GiB) | Instance Storage (GB) | Linux/UNIX Usage |
|---|---|---|---|---|---|
| **General Purpose - Current Generation** | | | | | |
| a1.medium | 1 | N/A | 2 GiB | EBS Only | $0.0255 per Hour |
| a1.large | 2 | N/A | 4 GiB | EBS Only | $0.051 per Hour |
| a1.xlarge | 4 | N/A | 8 GiB | EBS Only | $0.102 per Hour |
| a1.2xlarge | 8 | N/A | 16 GiB | EBS Only | $0.204 per Hour |
| a1.4xlarge | 16 | N/A | 32 GiB | EBS Only | $0.408 per Hour |
| t3.nano | 2 | Variable | 0.5 GiB | EBS Only | $0.0052 per Hour |
| t3.micro | 2 | Variable | 1 GiB | EBS Only | $0.0104 per Hour |
| t3.small | 2 | Variable | 2 GiB | EBS Only | $0.0208 per Hour |
| t3.medium | 2 | Variable | 4 GiB | EBS Only | $0.0416 per Hour |
| t3.large | 2 | Variable | 8 GiB | EBS Only | $0.0832 per Hour |

**Reserved Instances Model**

Reserved Instances provide you with a significant discount (up to 75%) compared to On-Demand instance pricing, and can be purchased for a 1-year or 3-year term. In addition, when Reserved Instances are assigned to a specific Availability Zone, they provide a capacity reservation, giving you additional confidence in your ability to launch instances when you need them. For applications that have steady state or predictable usage, Reserved Instances can provide significant savings compared to using On-Demand instances

Customers have the flexibility to change the Availability Zone, the instance size, and networking type of their Standard Reserved Instances.

**Reserved Instances Payment Options**

You can choose between three payment options when you purchase a Standard or Convertible Reserved Instance. With the All Upfront option, you pay for the entire Reserved Instance term with one upfront payment. This option provides you with the largest discount compared to On-Demand instance pricing. With the Partial Upfront option, you make a low upfront payment and are then charged a discounted hourly rate for the instance for the duration of the Reserved Instance term. The No Upfront option does not require any upfront payment and provides a discounted hourly rate for the duration of the term.

**Reserved Instances are recommended for:**

- Applications with steady state usage.
- Applications that may require reserved capacity.

- Customers that can commit to using EC2 over a 1 or 3 year term to reduce their total computing costs

The below is the pricing for the EC2 with Linux as operating system in North Virginia for a1.medium as the Instance type which is reserved instances.

| STANDARD 1-YEAR TERM | | | | | |
|---|---|---|---|---|---|
| **Payment Option** | **Upfront** | **Monthly*** | **Effective Hourly**** | **Savings over On-Demand** | **On-Demand Hourly** |
| No Upfront | $0.00 | $11.75 | $0.016 | 37% | $0.0255 |
| Partial Upfront | $67.00 | $5.62 | $0.015 | 40% | |
| All Upfront | $131.00 | $0.00 | $0.015 | 41% | |

| CONVERTIBLE 1-YEAR TERM | | | | | |
|---|---|---|---|---|---|
| **Payment Option** | **Upfront** | **Monthly*** | **Effective Hourly**** | **Savings over On-Demand** | **On-Demand Hourly** |
| No Upfront | $0.00 | $13.50 | $0.018 | 27% | $0.0255 |
| Partial Upfront | $77.00 | $6.42 | $0.018 | 31% | |
| All Upfront | $151.00 | $0.00 | $0.017 | 32% | |

| STANDARD 3-YEAR TERM | | | | | |
|---|---|---|---|---|---|
| **Payment Option** | **Upfront** | **Monthly*** | **Effective Hourly**** | **Savings over On-Demand** | **On-Demand Hourly** |
| No Upfront | $0.00 | $8.03 | $0.011 | 57% | $0.0255 |
| Partial Upfront | $134.00 | $3.72 | $0.01 | 60% | |
| All Upfront | $252.00 | $0.00 | $0.01 | 62% | |

| CONVERTIBLE 3-YEAR TERM | | | | | |
|---|---|---|---|---|---|
| **Payment Option** | **Upfront** | **Monthly*** | **Effective Hourly**** | **Savings over On-Demand** | **On-Demand Hourly** |
| No Upfront | $0.00 | $9.27 | $0.013 | 50% | $0.0255 |
| Partial Upfront | $154.00 | $4.31 | $0.012 | 54% | |
| All Upfront | $302.00 | $0.00 | $0.011 | 55% | |

**Spot Instances Model**

Amazon EC2 Spot Instances offer spare compute capacity in the AWS Cloud at steep discounts. Customers—including Yelp, NASA JPL, FINRA, and Autodesk—use Spot Instances to reduce costs and get faster results. Spot Instances provide acceleration, scale, and deep cost savings to big data workloads, containerized applications such as web services, test/dev, and many types of HPC and batch jobs.

At re:Invent 2017, we launched a new pricing model that simplified the Spot purchasing experience. The new model gives you predictable prices that adjust slowly over days and weeks, with typical savings of 70-90% over On-Demand. With the previous pricing model, some of you had to invest time and effort to analyze historical prices to determine your bidding strategy and maximum bid price. Not anymore.

**How does the new pricing model work?**

You don’t have to bid for Spot Instances in the new pricing model, and you just pay the Spot price that’s in effect for the current hour for the instances that you launch. It’s that simple. Now you can request Spot capacity just like you would request On-Demand capacity, without having to spend time analyzing market prices or setting a maximum bid price.

Previously, Spot Instances were terminated in ascending order of bids, and the Spot price was set to the highest unfulfilled bid. The market prices fluctuated frequently because of this. In the new model, the Spot prices are more predictable, updated less frequently, and are determined by supply and demand for Amazon EC2 spare capacity, not bid prices. You can find the price that’s in effect for the current hour in the EC2 console.

**On-demand Vs. Reserved Vs. Spot Instances**

Just like renting or leasing a house, when you pay for servers from AWS, there are many, many different options. I’m hoping to cover the pricing options in a way that is useful. With the options, you get exactly the same server, but you pay a different price because of the different commitment level from either you or from AWS.

| Option | Discount | Description |
|---|---|---|
| On-Demand | 0% | There's no commitment from you. You pay the most with this option. |
| Reserved | 40%–60% | 1-year or 3-year commitment from you. You save money from that commitment. |
| Spot | 60%–90% | Ridiculously inexpensive because there's no commitment from the AWS side. |

**Dedicated Hosts & Dedicated Hardware's**

Amazon EC2 Dedicated Instances

Dedicated Instances are Amazon EC2 instances that run in a VPC on hardware that's dedicated to a single customer. Your Dedicated instances are physically isolated at the host hardware level from instances that belong to other AWS accounts. Dedicated instances may share hardware with other instances from the same AWS account that are not Dedicated instances. Pay for Dedicated Instances On-Demand, save up to 70% by purchasing Reserved Instances, or save up to 90% by purchasing Spot Instances.

You can also use Dedicated Hosts to launch Amazon EC2 instances on physical servers that are dedicated for your use. Dedicated Hosts give you additional visibility and control over how instances are placed on a physical server, and you can reliably use the same physical server over time. As a result, Dedicated Hosts enable you to use your existing server-bound software licenses like Windows Server and address corporate compliance and regulatory requirements.

**AWS Marketplace**

AWS Marketplace is a buyer and seller online shop launched by Amazon in 2012. It enables a user to buy and sell software that runs on Amazon Web Services. A company uses the AWS Marketplace to market and sell its AWS-approved software products; Amazon oversees sellers and products in the AWS Marketplace to verify their reliability, ethics and security levels. Amazon also controls all billing and payment options through AWS user information. Software sold in the AWS Marketplace aims to add value to current AWS public cloud services; it is available in a variety of software categories.

Once software has been purchased from the AWS Marketplace, the end user downloads and deploys it. AWS maintains all records of billing, payment collection and reporting through user accounts; buyers and sellers access the products through the AWS Management Console. Software purchased on the AWS Marketplace can be used across a variety of categories. Software sold in the AWS Marketplace covers a range of categories, including operating systems, security, networking, storage, business intelligence, databases, DevOps and software-as-a-service subscriptions. Developer tools are also available in the AWS Marketplace.

Software is made available to a user through an Amazon Machine Image format, which provides the user with all the necessary information to run the software with existing programs in his or her environment.

**Overview of AWS Pricing Calculator (Estimate the cost for your architecture solution)**

AWS Pricing Calculator lets you explore AWS services and create an estimate for the cost of your use cases on AWS. You can model your solutions before building them, explore the price points and calculations behind your estimate, and find the available instance types and contract terms that meet your needs. This enables you to make informed decisions about using AWS. You can plan your AWS costs and usage or price out setting up a new set of instances and services.

AWS Pricing Calculator is useful both for people who have never used AWS and for users who want to reorganize or expand their AWS usage. You don't need any experience with the cloud or AWS to use AWS Pricing Calculator.

**GPU Instances:** A GPU instance is recommended for most deep learning purposes. Training new models will be faster on a GPU instance than a CPU instance. You can scale sub-linearly when you have multi-GPU instances or if you use distributed training across many instances with GPUs.

**Pricing for AWS Pricing Calculator**

AWS Pricing Calculator is free for use. It provides an estimate of your AWS fees and charges, but the estimate doesn't include any taxes that might apply to the fees and charges. AWS Pricing Calculator provides pricing details for your information only. If the prices on the marketing page are different from the prices that AWS Pricing Calculator uses, AWS honors the prices from the marketing pages.

**Billing accounts**

AWS Billing and Cost Management is the service that you use to pay your AWS bill, monitor your usage, and budget your costs.

AWS automatically charges the credit card you provided when you signed up for a new account with AWS. Charges appear on your credit card bill monthly. You can view or update credit card information, and designate a different credit card for AWS to charge, on the Payment Methods page in the Billing and Cost Management console.

**AWS Budgets**

AWS Budgets gives you the ability to set custom budgets that alert you when your costs or usage exceed (or are forecasted to exceed) your budgeted amount. You can also use AWS Budgets to set RI utilization or coverage targets and receive alerts when your utilization drops below the threshold you define. RI alerts support Amazon EC2, Amazon RDS, Amazon Redshift, and Amazon ElastiCache reservations.

Budgets can be tracked at the monthly, quarterly, or yearly level, and you can customize the start and end dates. You can further refine your budget to track costs associated with multiple dimensions, such as AWS service, linked account, tag, and others. Budget alerts can be sent via email and/or Amazon Simple Notification Service (SNS) topic.

**Quotas and limits**

For the services in AWS there is a limit per region, if a user wants to increase the limit, it can be requested to AWS support team with business justification. Many services contain limits that cannot be changed.

Example:

- By default, when you create an EC2 account with Amazon, your account is limited to a maximum of **20** instances per EC2 region.
- By default, each security group supports up to **50** rules and each network interface can have up to **5** security groups, for a maximum of **250** rules per interface.
- Currently you **can create** 200 **subnets per VPC**. If you would like to **create** more, please submit a case at the support center.
- VPC – 5 per region.
- 5 Elastic IP addresses per Region.
- 50 Customer gateways per Region.
- 5 Internet gateways per Region.
- 200 Network ACLs per VPC.
- 200 Route tables per VPC, This limit includes the main route table.