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AWS Economics and Billing

Train Overview

In this train we will cover the following:

We will firstly be going over the **AWS costing model** and see what the main costing categories are. From there, we will be diving into the **AWS Pricing Calculator** by means of theory and an example. Finally, we will arrive at **AWS cost management services** and dive into a few examples of how you can track, manage and optimise your cloud spend.

The AWS Costing Model

Total Cost of Ownership

AWS Pricing Calculator

AWS Billing and Cost Management

Conclusion

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How Does AWS Bill You for Services Consumed?

The main AWS cost drivers are compute, storage and data transfer

AWS Billing Model	Typical AWS Service Examples
Computation - Charges incurred per hour (or per second on Linux). - Different billing model per computation service type (case by case basis).	An AWS service that provides secure, resizable compute capacity in the cloud • Amazon EC2 • Amazon EC2 Auto Scaling • AWS Elastic Beanstalk • AWS LightSail • AWS Batch
Storage - Charges are incurred per gigabyte stored.	AWS offers a complete range of services for you to store, access, govern, and analyse your data • Amazon S3 • Amazon FSx • Amazon Elastic Block Store • Amazon S3 Glacier • Amazon elastic File System
Transfer - Typically inbound data transfer is not billed. - Outbound data transfer is charged per gigabyte transferred.	AWS transfer services are a fully managed host of services for the transfer of data into and out of AWS storage services • AWS DataSync • AWS Transfer Family • AWS Snow Family

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How do You Pay Less with AWS?

The different ways to save money with AWS

Pay As You Go

The **pay as you go model** is ideal if you are **not sure what the forecasted demand** of your service/product will be. This model therefore **helps you to adapt to real-time demand** without running the risk of over positioning or redundant capacity. As the name suggests you only **pay for the AWS services you consume** as and when they are used/required.

Pay Less when You Reserve

Reserved instances (RI) can save a company a tremendous amount of money if used properly. **With this model you pay capital upfront to reserve resources** such as Amazon EC2 compute resources or Amazon RDS database resources. With reserved instances, **the larger the upfront capital investment** t**he larger the discount.** With RI you can save up to 75%.

Pay less when you use more and as AWS grows

With AWS the **higher the volume of service** consumption the **higher the discount**. This is in line with the AWS tiered pricing model for selected services. Not only that but, as **AWS grows their global footprint** so does the **prices decrease** for particular services.

The AWS 12 Month Free Tier Account

For more information on AWS 12 month free tier services please visit this link

Amazon Web Service	Function of the Service	Free Usage Tier Limitations
Amazon EC2 	Provides secure, resizable, scalable compute capacity in the cloud	750 hours per month of Windows t2.micro or t3.micro instance dependent on region
Amazon S3 	Amazon Simple Storage Service (S3) is an object storage service with industry leading performance and availability	5 GB of free standard storage for 12 months with 20 000 get and 2 000 put requests
Amazon RDS 	An AWS service offering for setting up and managing relational databases in the cloud	750 Hours per month of db.t2.micro database usage and 20 GB of SSD storage
Amazon API Gateway 	Fully managed service that makes it easy to create, publish, maintain, monitor, and secure APIs at scale	One million free API calls to Amazon API Gateway per month

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Amazon Web Service	Function of the Service	Free Usage Tier Limitations
Amazon CloudFront 	Content delivery service that delivers data, videos, and applications to customers globally with low latency and high transfer speed	50 GB of free data transfer out and 2 million free HTTP or HTTPS requests
Amazon Comprehend 	Managed NLP service that finds insights and relationships in text data	5 Topic Modeling Jobs up to 1 MB each per month for the first 12 months
Amazon Connect 	Omnichannel cloud contact center that allows you to provide customer support at a reduced cost	90 Minutes free Amazon Connect per month
Amazon Elastic File System (EFS) 	Simple, scalable, shared file storage service for Amazon EC2 instances	5 GB of EFS storage

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Amazon Web Service	Function of the Service	Free Usage Tier Limitations
Amazon Elastic Block Storage 	Persistent, low-latency block-level storage	30 GB of Amazon EBS - any combination of SSD or Magnetic
Amazon Elastic Container Registry 	A managed service for the storage and retrieval of docker images	500 MB of free storage per month
Amazon Elastic Transcoder 	Amazon Elastic Transcoding allows for video transcoding in the cloud	20 Minutes of audio transcoding
Amazon GameLift 	Simple, fast and cost-effective service for game hosting in the cloud	125 Hours free on-demand hosting per-month

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The AWS 12 Month Free Tier Account

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Amazon Web Service	Function of the Service	Free Usage Tier Limitations
Amazon LEX 	Build chatbots into applications using voice and text	10 000 text and 5 000 speech requests per month
Amazon MQ 	Amazon MQ makes it easy to set up, manage and operate message brokers on AWS	750 hours of a single-instance mq.t2.micro or mq.t3 broker per month
Amazon PinPoint 	Targeted push notification for mobile application	5 000 free targeted users per month
Amazon Polly 	Managed service to turn text into lifelike speech	5 000 000 free characters per month

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The difference between the on-premise IT costing model and the AWS cloud costing model

Total cost of ownership (TCO) is a financial estimate of the direct and indirect costs of a product or service

	On-Premise IT	Cloud Model
TCO Considerations	• Software, security, network and hardware requirements, upgrades and maintenance • Size, location, storage, cooling • IT team • Performance optimisation and customisation	• Training • Development • Outsourcing/Insourcing/Co-sourcing/ Collaboration • Customisation • Region, availability, computation, customer base, services
Advantages	Traditional on-premise IT model allows for more flexibility and control over the cost-base, solution, infrastructure and network	• Reduced startup investment • Secure • Rapid ideation • Quick deployment • Remotely accessible • Scalable • No manual software updates
Drawbacks	• Large upfront capital investment • Expensive to scale with business requirements • Risk of over or underestimating requirements • Requires dedicated full time IT resources • Constant need for upgrades and maintenance	Although cloud computing holds several advantages, given the increased complexity of cloud solutions it is harder to calculate TCO for these systems, services and applications. There is also a need for either upskilling current IT staff or outsourcing workloads in the cloud as and when needed.

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Total Cost of Ownership (TCO) Model

The TCO model can be used as a guide to ensure all costing aspects of a potential new project is addressed

TCO Categories	TCO Components
Initial Planning and Vendor Selection	• **Vendor Analysis**: Evaluate different vendors on the same criteria. Explore vendors service offerings and the corresponding service functionality. • **Vendor SLA Analysis**: Analyse and audit vendor service level agreements and license agreements.
Hardware, Software and after sales customer support	• **Server, storage, hardware and maintenance:**. Here we need to consider the capital required to acquire servers and storage for on premise or rent computing instances for cloud models. We also need to consider maintenance and upgrades for on premise solutions. • **OS and security:** We need to consider the capital required for procuring operating systems, security and backups. • **Full time IT staff:** Consideration needs to be given to the capital requirements for a full time IT staff to maintain, service and update either the on premise or cloud IT solutions.
Application subscription	• **Subscription or maintenance costs**: If third party software will be used and hosted either on the cloud or on premise we need to consider the licensing costs. That is, we need to look at number of licenses and cost per license per annum.

Total Cost of Ownership (TCO) Model

The TCO model can be used as a guide to ensure all costing aspects of a potential new project is addressed

TCO Categories	TCO Components
Solution implementation	• **Detail design:** We need to consider who will be performing the preliminary design i.e. will the design be insourced or outsourced or co-sourced and what will the respective costs be. • **Implementation and testing:** Here we need to weigh up the costs associated with configuring the application, integrating the solution, testing the new system and rolling out the solution at an enterprise level. • **System support:** Once implemented there will be a need for constant maintenance and support. Here we once again need to look at the insourcing, outsourcing and co-sourcing model and weigh the financial impact.
Initial and ongoing training costs	• **User and staff training:** With the new system implemented there are some change management considerations. That is we need to think of how the people i.e. the users and the staff will be impacted. We need to consider if either the user or the IT staff or both will need additional training and or upskilling.

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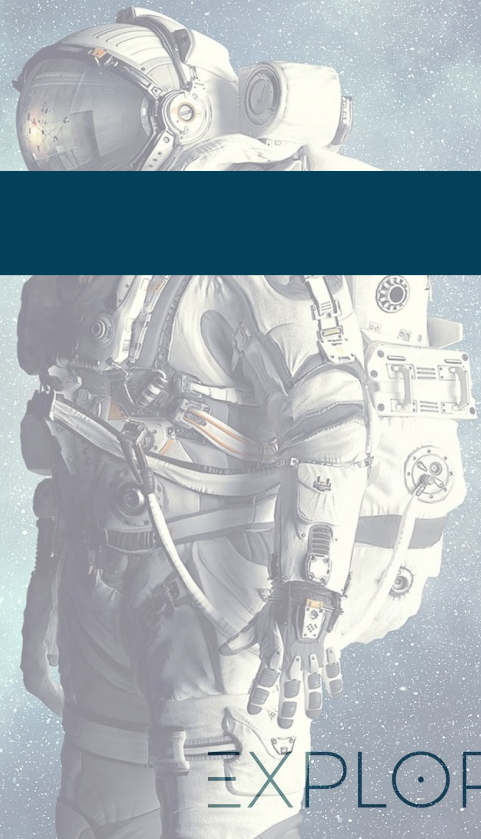
Conclusion



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Overview of the AWS Pricing Calculator

Overview of the AWS Pricing Calculator

The AWS pricing calculator is a web-based tool to assist you in estimating the total cost of your detailed solution.

You can access the AWS Pricing Calculator here.

Advantages of Using the AWS Pricing Calculator

» Easily dive into the billing breakdown of your solution
» Share estimates and calculations with internal and external stakeholders
» Analyse estimates by grouping and aggregating the billing information
» Export to convenient formats such as .csv for further analysis or sharing purposes

How does the AWS Pricing Calculator Pipeline work?

1. **AWS Pricing Calculator:** Estimate the cost of AWS products and services
2. **Add Services:** Search and add AWS services that you need
3. **Configure Service:** Enter the details of your usage to see service costs
4. **View Estimate Totals:** See estimated costs per service, service group, and totals

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AWS Pricing Calculator Guided Example

Suppose you are an AI start-up in the medical imaging field. You have a team of 2 full time data scientists that will be developing, optimising and deploying your solution in the AWS Sagemaker environment.
Use the AWS Pricing Calculator to estimate the monthly cost of your solution.

Discussion	AWS SMC Visual Example
1. We start our estimation process by logging into the AWS Pricing Calculator. 2. Next we select the AWS Sagemaker Service for estimation. 3. From there we describe our estimation project. 4. We then select the region where we would like our Sagemaker solution to be hosted.	

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AWS TCO Guided Example

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Use the AWS Pricing Calculator to estimate the monthly cost of your solution.

Discussion	AWS SMC Visual Example
5. The next step is to select the AWS SageMaker services that we will be using in our solution. In our example we'll only be making use of SageMaker Studio Notebooks. This option is selected by togelling the button.	

AWS TCO Guided Example

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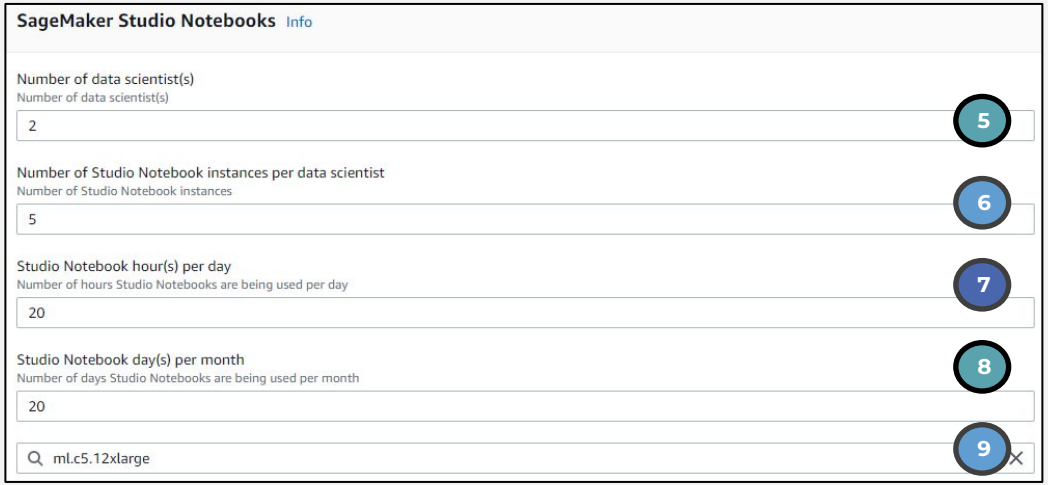
Discussion	AWS SMC Visual Example
6. Next we specify the number of data scientists that will be working in our start-up. 7. From there we specify the number of notebook instances per data scientist. 8. We also need to specify the hours that we will be making use of the managed notebook service daily. 9. The final notebook metric we need to specify is the total amount of days per month we will be using the service. 10. Finally we specify the EC2 instance on which our notebooks will be running.	

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AWS TCO Guided Example

Suppose you are an AI start-up in the medical imaging field. You have a team of 2 full time data scientists that will be developing, optimising and deploying your solution in the AWS Sagemaker environment.
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Discussion	AWS SMC Visual Example
11. The final step is to click on the 'show calculations' tab to expose our total estimated monthly cost. We can see that our start-up will roughly be running at $ 11 400 per month. With the calculations as follow: *2 data scientist(s) x 5 Studio Notebook instance(s) = 10.00 Studio Notebook instance(s)* *10.00 Studio Notebook instance(s) x 20 hours per day x 20 days per month = 4,000.00 SageMaker Studio Notebook hours per month* *4,000.00 hours per month x 2.856 USD per hour instance cost = 11,424.00 USD(monthly On-Demand cost)* ***Total cost for Studio Notebooks (monthly): 11,424.00 USD***	

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AWS Cost Management Product Suite

AWS offers an extensive list of services to assist you in managing, tracking and optimising your cloud spend

Access | **Organise** | **Understand** | **Control** | **Optimise**

With

AWS Cost & Usage Reports	AWS Cost Categories	AWS Cost Explorer	AWS Budgets	AWS Recommendations
Cost Reporting	Cost Categorisation	Data Visualisation	Cost Budgeting	Recovered Instances
Usage Reporting		Trend Analyses	Usage Budgeting	
Data Analysis	Cost Allocation		Email Alerting	Utilisation Alerting
Cost Visibility		Cost Drivers	AWS Credit Sharing	
RI Allocation	Tagging	Usage Patterns	RI Discount Sharing	Coverage Alerting

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AWS Cost & Usage Reports (CUR)

For more information on AWS CUR please see this link

Aws Cost and Usage Reports	AWS CUR Use Cases
The **AWS CUR contains the cost and consumption data** for all AWS services linked to a particular account. A **CUR is set up on a case by case basis** in the AWS management console. Once set up, the AWS CUR will contain the current month's billing information. This **information** will be sitting in a **S3 bucket** that you specified at the initial CUR setup.	• Receive billing information on an hourly, daily or monthly interval • Break down billing information by product, service, resource or tag • Create new reports, delete old reports or retrieve reports using the AWS CUR API Reference • Explore monthly trends

AWS Cost Categories

For more information on AWS Cost Categories please see this link

AWS Cost Categories	AWS Cost Categories Use Cases
The **AWS Cost Categories** is a service sitting in the AWS Cost Management product suite. This service **enables the user to group spend** into meaningful **buckets**. These buckets can either be **standardised spend groups** as set by AWS or **custom defined spend categories** defined by the user. Once the **spend categories have been set up** you will be able to **view your spend information**, at the beginning of the month, **in AWS Cost Explorer, AWS Budgets, and AWS Cost and Usage Report (CUR**).	• Create custom spend categories to track monthly spending on critical and non-critical cloud services • Automatically categorise your spend information in predefined categories

AWS Cost Explorer

For more information on AWS Cost Explorer please see this link

AWS Cost Explorer	AWS Cost Explorer Use Cases
AWS Cost Explorer is a web-based tool, accessible through the AWS management console, that can be used to v**iew and analyse your cost usage**. With **AWS Cost Explorer your cost** can be explored in **three main ways**: 1) Using the main graph, 2) Using the cost and usage reports ,or 3) Using the cost explorer RI reports *AWS Cost Explorer uses the same dataset used to generate the AWS Cost and Usage reports and the Detailed Billing Reports.*	• Review charges and usage associated of individual accounts • Review charges and usage associated of AWS organisations • Forecast estimated spending for the next three months • Get recommendations for the best reserved instance for your specific usage

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AWS Budgets

For more information on AWS Budgets please see this link

AWS Budgets	AWS Budgets Use Cases
AWS Budgets allows a user to **set up custom budgets** that **sends out an alert** when your **current, or forecasted, costs** are set to **exceed the budgeted amount**.	• Set alerts when reservation utilisation drop below the defined threshold • Set alerts when consumption of a particular resource is set to exceed the budget amount • Set coverage targets and alerts when metrics drop below defined thresholds

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Conclusion

After completing this train you should understand:

1. The AWS Costing Model
2. What TCO means and what are some considerations when developing a TCO model
3. How to use the AWS Pricing Calculator
5. The basics of AWS Cost and Billing Management

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