
Cost Management in the AWS Cloud

AWS Whitepaper



Cost Management in the AWS Cloud: AWS Whitepaper

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Abstract

This is the second in a series of whitepapers designed to support your cloud journey. This paper seeks to empower you to maximize value from your investments, improve forecasting accuracy and cost predictability, create a culture of ownership and cost transparency, and continuously measure your optimization status.

Amazon Web Services (AWS) provides a suite of cost management tools to help you get the most value from your AWS investment. This paper provides an overview of many of these tools, as well as organizational best practices for creating a cost-conscious mindset.

Here are the other whitepapers in this series:

- [Laying the Foundation: Setting Up Your Environment for Cost Optimization](#)
- [Amazon EC2 Reserved Instances and Other Reservation Models](#)
- [Leveraging Amazon EC2 Spot Instances at Scale](#)
- [From Cloud Cost to Cloud Value](#)
- [Automating Elasticity](#)
- [Right Sizing: Provisioning Instances to Match Workloads](#)
- [AWS Storage Optimization](#)

Introduction

Migrating to the cloud enhances your business's ability to scale and flex to the demands of your company's workloads. Historically, computing costs were tied to a quarterly or yearly hardware procurement investment. With cloud technology, you now have the flexibility to initialize resources and services at any time—you pay only for what you use. This has shifted the way that costs are understood, managed, and optimized.

In the past, hardware costs were treated as a capital expense, which led to predictable resource procurement and cost patterns. You had to purchase enough servers to support your company's most highly trafficked day, which resulted in waste because many of these servers would lie idle for much of the year. Because the cloud lets you scale on demand, you pay only for the resources you use, which minimizes waste but can result in variable cost patterns.

The ability to scale up and down on demand has allowed resource procurement to transition from sole ownership of the finance team to stakeholders across IT, engineering, finance, and other teams. This democratization of resource procurement has initiated an ever-growing group of cost-conscious stakeholders who are now responsible for understanding, managing, and, ultimately, optimizing costs.

Creating a Cost-Conscious Culture

One of the first steps on your company's cloud journey is to establish best practices for cloud cost management. Your organization should create a Cloud Center of Excellence and designate key stakeholders to oversee technical and architectural quality and advance a cost-conscious agenda.

This group often starts small and grows over time. A typical journey might look something like this:

- **Cost awareness** – An individual from the finance or engineering team allocates a few hours per week to learn the basics of cloud cost management using AWS training resources, helps establish basic governance best practices, and participates in organization-wide cloud direction discussions. This individual also tends to evangelize the use of AWS reports and tools.
- **Cost management and optimization** – Over time, the individual or small group that is driving the effort expands to a larger team, whose members define custom metrics, adopt and disseminate advanced reporting methodologies, and enforce cost allocation strategies (often via AWS resource tags).
- **Evangelism and process optimization** – As financial and cost-management needs become more complex, a larger, dedicated team with advanced skills supports cost management across the organization and establishes internal communities of interest to support education and collaboration on key cloud topics.

Cost Governance Best Practices

To scale increasingly complex workloads that are run on AWS, your organization should emphasize the creation of clear, effective policies and governance mechanisms around cloud deployment, usage, and cost responsibility. Keep in mind that executive support for cost-management processes is critical.

- **Resource controls** (policy-based and automated) govern who can deploy resources and the process for identifying, monitoring, and categorizing these new resources. These controls can use tools such as AWS Service Catalog, AWS Identity and Access Management (IAM) roles and permissions, and AWS Organizations, as well as third-party tools such as ServiceNow.
- **Cost allocation** applies to teams using resources, shifting the emphasis from the IT-as-cost-center mentality to one of shared responsibility.
- **Budgeting processes** include reviewing budgets and realized costs, and then acting on them.
- **Architecture optimization** focuses on the need to continually refine workloads to be more cost-conscious to create better architected systems.
- **Tagging and tagging enforcement** ensure cost tracking and visibility across organization lines.

Having effective processes in place ensures that the right information and controls are available to the right people. This reinforces channels of communication for cost-related inquiries, which strengthens your cost-conscious culture.

Getting Started with Cost Management

To gain insight and take action on your costs, start with your monthly AWS bill, which is accessible via the [AWS Billing and Cost Management](#) console. Your AWS bill breaks down costs by service, AWS Region, and linked account.

Although this is a great place to start for high-level cost information, the AWS Management Console also comprises a suite of billing and cost management tools that give you fine-grain access, understanding, and control over your AWS costs and usage. These tools include AWS Cost Explorer, the AWS Cost and Usage Reports, and AWS Budgets.

AWS Cost Explorer

[AWS Cost Explorer](#) helps you visualize, understand, and manage your AWS costs and usage over time. This is done via an intuitive interface that enables you to quickly create custom reports that include charts and tabular data. You can analyze your cost and usage data in aggregate (such as total costs and usage across all accounts) down to granular details (for example, m2.2xlarge costs within the Dev account tagged "project: Blackthorn").

Cost Explorer gives you data exploration functionality, such as the ability to group and filter your cost and usage information. This can help you quickly and easily access the data you need to make data-driven decisions. You can also change the chart type and time frame, as well as access advanced filters.

When you sign up for Cost Explorer, AWS prepares the data about your costs for the current month and the last 3 months, and then calculates the forecast for the next 3 months. Cost Explorer can display up to 12 months of historical data, data for the current month, and the forecasted costs for the next 3 months.

To help you get started, Cost Explorer provides a selection of default reports to help you pinpoint cost and usage trends. These reports include:

- **Monthly costs by AWS service** – Visualize the costs and usage associated with your top five cost-accruing AWS services and get a detailed breakdown on all your services in a table view.
- **Amazon EC2 monthly cost and usage** – View all [Amazon Elastic Compute Cloud](#) (Amazon EC2) costs over the past three months, as well as current month-to-date costs.
- **Monthly costs by linked account** – View the distribution of costs across your organization. To recreate this chart, add **Linked Account** as the grouping dimension in Cost Explorer.
- **Monthly running costs** – See all running costs over the past three months and view forecasted costs for the coming month, with a corresponding confidence interval.
- **Reserved Instance (RI) reports** – To learn more about the RI Utilization and Coverage reports, see [Reserved Instance \(RI\) Reporting](#).

To create and save personalized reports, you can use the following functionality:

- **Set time interval and granularity** – Set a custom time interval, and determine whether you would like to view your data monthly or daily.
- **Filter/group your data** – Take advantage of filtering and grouping functionality and use a variety of available dimensions.

- **Forecast future costs and usage** – Use forecasting to get a better idea of what your costs and usage may look like in the future.

Available filters in Cost Explorer include:

- API Operation – Requests made to and tasks performed by a service
- AWS Services – Individual AWS services, such as Amazon EC2 or [Amazon Simple Storage Service \(Amazon S3\)](#)
- AWS Regions – Geographic areas in which AWS hosts your resources
- Availability Zones – Distinct locations within an AWS Region
- Usage Types – The units that each service employs to measure the usage of a specific type of resource
- Usage Type Groups – Predefined filters that collect specific categories of usage into a single filter (e.g., EC2-ELB – Running Hours)
- Cost Allocation Tags – AWS resource tags that have been activated for cost allocation
- Instance Types – The type you specified when launching an EC2 host
- Linked Accounts – Members of a consolidated billing family
- Purchase Option – Identify On-Demand, Spot, and Reserved Instance usage

Next, save your progress as a new report that you can refer to later.

AWS Cost and Usage Report

The [AWS Cost and Usage Report](#) tracks your AWS usage and provides estimated charges associated with that usage. You can configure this report to present the data hourly or daily. It is updated at least once a day until it is finalized at the end of the billing period. The AWS Cost and Usage Report gives you the most granular insight possible into your costs and usage, and it is the source of truth for the billing pipeline. It can be used to develop advanced custom metrics using business intelligence, data analytics, and third-party cost optimization tools.

The AWS Cost and Usage Report is delivered automatically to an S3 bucket that you specify, and it can be downloaded directly from there (standard S3 storage rates apply). It can also be ingested into Amazon Redshift or uploaded to Amazon QuickSight.

AWS Budgets

[AWS Budgets](#) lets you set custom cost and usage budgets and receive alerts when you approach or exceed your budgeted amount. You can create budgets from the AWS Budgets Dashboard or programmatically via the AWS Budgets API. Budgets can track cost or usage monthly, quarterly, or yearly. You can create a budget by using the same filters available in Cost Explorer.

You can monitor budgets via the Budgets Dashboard in the AWS Management Console. For both cost and usage budgets, alerts can be set against actual or forecasted budgeted values.

From there, you can further specify the percent accrual toward the cost or usage threshold. For example, specifying 100% of the actual costs of a \$1,000 budget will alert you when the \$1,000 threshold is exceeded. Creating a second alert that notifies you when 90% of your \$1,000 budget has been reached will give you more time to take proactive measures. You can also supplement these alerts by setting one against forecasted cost or usage values (e.g., 105% of your budgeted value), which will alert you of possible anomalies or changes in behavior.

Each budget can have up to 5 associated alerts. Each alert can have up to 10 email subscribers and can optionally be published to an SNS topic.

Other Cost-Related Metrics

Creating cost-related metrics and then tracking them supports a data-driven decision-making culture. This makes it easy to understand and manage your costs and identify opportunities for savings. Some examples of cost-related metrics that you can implement include percentage of:

- Resource utilization
- Instances turned off daily
- Instances tagged
- Amazon EC2 instances that have undergone EC2 Right Sizing

Organizations taking advantage of AWS cost optimization offerings such as Reserved Instances and Spot Instances should develop metrics around them, such as percentage of:

- Reserved Instance coverage of key workloads
- Aggregate utilization of EC2 Reserved Instances
- Application of EC2 Spot Instances and any associated discounts

As organizational needs evolve, cost management requirements tend to evolve as well toward quantifying savings. Savings can be realized as a result of cost optimization efforts:

- **Workload management** – Gain elasticity by turning off development, test, and staging workloads when not in use. A common approach is to mandate on/off for all such instances except those flagged manually as exceptions:

On/off savings = (highest hourly cost x hours per month) – actual monthly cost

- **Reserved Instance utilization** – Maximize Reserved Instance utilization using the EC2 Reserved Instance Reports in AWS Cost Explorer. A typical utilization target is 70% of always-on workloads.
- **Reserved Instance Right Sizing** – Apply a benchmark to a point in time and measure savings potential by right sizing your EC2 instances. Over time, you can measure savings achieved through right sizing and compare that to your initial benchmark.

These are a few examples of possible metrics that you can implement in your cost optimization journey. You can further refine your metrics to track unit costs along the following dimensions:

- Number of customers or active subscribers
- Revenue generated
- Product or business unit
- Internal user
- Experiment

By using the cost metrics outlined above, you can link your cloud computing costs and usage to your business objectives.

Conclusion

AWS provides a set of cost management tools out of the box to help you manage, monitor, and, ultimately, optimize your costs. To get started, identify someone to set the standard for cloud excellence at your organization, get started using cost management tools, and define and track against a set of cost-related benchmarks for cost optimization. As your cost management capabilities grow, you can begin to use more advanced metrics, set budgets and alerts, and use advanced analytics to identify additional savings opportunities.

To learn more about the tools that AWS provides to help you access, understand, allocate, control, and optimize your AWS costs and usage, see [AWS Cost Management](#).

Resources

- [AWS Architecture Center](#)
- [AWS Whitepapers](#)
- [AWS Architecture Monthly](#)
- [AWS Architecture Blog](#)
- [This Is My Architecture videos](#)
- [AWS Answers](#)
- [AWS Documentation](#)

Document Details

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AWS Glossary

For the latest AWS terminology, see the [AWS Glossary](#) in the *AWS General Reference*.