White Paper: **February 2023**

Comparing Amazon Web Services Tools for Cloud Cost Management and Optimization

Executive summary

Enterprises worldwide are making increasingly large investments in public cloud infrastructure to benefit from the promises of improved agility, faster time to market, and decreased risk.

Cloud cost management and optimization can become a big challenge as organizations find that the decentralized nature and rapid scale of the public cloud lead to much larger bills than expected. Beyond surprisingly high costs, organizations often find their teams spending more time trying to track and account for how their public cloud budget was used, rather than taking advantage of the benefits that drove them to the cloud in the first place.

Amazon Web Services (AWS) offers a number of tools designed to help its customers track and manage costs related to its services. This white paper breaks down some of the common cloud financial management challenges that our customers face as they evolve through their cloud journey, highlights the AWS tools designed to help alleviate these challenges, and explains why cloud consumers with more advanced cloud environments may outgrow them.

AWS vs. third-party tools: Do I have to choose one or the other?

This white paper outlines the key capabilities organizations should consider at each phase of the Cloud Management Maturity Model, with a specific focus on the cloud financial management area of excellence.

While our framework was developed based on our work with thousands of customers at all different stages in their cloud journey, it's important to clarify that the ideal approach for cloud financial management does not necessarily entail 100 percent reliance on one tool over another. In fact, many customers of VMware Tanzu CloudHealth® use the platform alongside AWS tools as part of their cloud financial management practice; this white paper explores examples of this.

Ultimately, the decision comes down to the number of tools and the amount of manual work your teams will be responsible for to manage complex, heterogeneous cloud environments.

Note: All descriptions of AWS tool capabilities in this white paper are current as of April 2021 and will be updated as needed.

The cost visibility challenge

Challenge: I need to gain visibility into cloud costs across my organization

Gaining visibility is crucial as you grow your cloud footprint. This doesn't mean just being able to see the assets in your AWS environment. You need to be able to allocate the charges in the AWS bill to the responsible cost center, understand how services are being provisioned and configured, identify inefficiencies, and view all of this data in ways that are relevant and useful for a variety of stakeholders with different priorities.

Many organizations start their cloud journey with AWS Cost Explorer and spreadsheets. As organizations advance in their cloud journey, the need for more granular visibility, operational efficiency, and information management becomes too overwhelming for individuals and teams.

How AWS tools address the visibility challenge

AWS Cost and Usage Report

AWS directs all billing data to an Amazon Simple Storage Service (S3) bucket called the Cost and Usage Report. This report may have millions of line items tracking cost, utilization, Savings Plans, Reserved Instances, and other relevant information. Customers can use other AWS tools to filter the Cost and Usage Report based on parameters such as tags, budgets and accounts.

For further customization within the AWS environment, and at an additional cost, the Cost and Usage Report can be ingested into other AWS services, such as Amazon Athena, Amazon Redshift, and Amazon QuickSight.

AWS Cost Explorer

This tool helps customers visualize, understand and manage their AWS costs over time by providing:

- A set of default, out-of-the-box reports for AWS service costs
- AWS service costs by resource-level filters
- The ability to select and purchase Savings Plans
- The ability to launch other AWS services, such as Amazon Forecast and AWS Budgets, for future costs

AWS Cost Categories

This feature allows customers to group costs stemming from different accounts or tags into a category. Costs for these categories will then be visible in the AWS Cost Explorer, Budgets, and Cost and Usage Report tools.

AWS Budgets

This tool allows customers to create budgets for predefined time periods and to track costs, usage, and utilization of Savings Plans or Reserved Instances. It can also deliver regular budget reports. Budgets are accessible within AWS Cost Explorer.

What you need to consider about AWS tools for cost visibility

These tools help organizations gain visibility and answer simple questions about cloud costs and usage. However, as organizations mature in their cloud journey, more challenging cloud financial management challenges arise. Some of the most common challenges are difficulty performing cost reallocation, achieving operational efficiency, and understanding total cost of ownership (TCO).

Keep the following points in mind when considering using AWS tools for comprehensive visibility into cloud costs.

Piecing together data among disparate tools

While AWS offers various tools to provide visibility into cloud spend, choosing the right combinations of these tools and understanding how to best use them can be extremely complex. This is exacerbated when different teams or departments across the organization use these tools in different ways.

One customer of Tanzu CloudHealth estimates that, since enhancing their cost visibility practices beyond their cloud service providers' tools with the Tanzu CloudHealth platform, their teams have saved as much as 20 hours per week on cost management tasks while improving visibility from about 10 percent of their environment to 100 percent.

Normalized data with customizable views for cross-functional teams

AWS tools provide cost visibility based on the price of the services leveraged. This is an important distinction because discounts and adjustments applied to the bill at the end of the month could result in a significant difference between AWS service pricing and actual costs billed to the customer.

For example, many customers use the Tanzu CloudHealth platform to report on amortized costs, apportioned costs, and discounted costs, among others. They can also create distinct Perspectives that focus on the relevant key performance indicators (KPIs) for different users, so the IT and finance teams are presented with the information that's most relevant to them. The ability to feed this data into business intelligence dashboards is key for incorporating accurate cloud cost information into other key decisions.

Manual work configuring and maintaining data for reporting

The AWS tools for cost visibility have become more advanced over time. However, as cloud usage grows, large customers often find their teams inundated with manual tasks related to maintaining the efficacy of reports based on these tools. One example is ensuring that all resources in the environment adhere to the account setup policies and tags that these tools rely on. Further, writing and editing policies in AWS requires a certain level of coding expertise and knowledge of the AWS operating model, which can limit business agility.

Allocating savings from Reserved Instances and Savings Plans

Many organizations embrace committed use programs, such as AWS Savings Plans or Reserved Instances, for discount pricing compared to on-demand instances.

To maximize usage of these discount mechanisms, many organizations with linked or consolidated accounts follow a best practice of purchasing from a top-level account in their hierarchy so that, in the event the purchasing account does not have eligible services to use up the commitment, other linked accounts will still be able to reap the benefits of the discount.

However, many customers struggle to allocate the savings from Reserved Instances and Savings Plans to the groups that actually use the resources. If a top-level account in the hierarchy made the initial purchase, AWS will still attribute the full cost to the purchasing account, even if that account did not use any of the discounted resources.

On the other hand, customers of Tanzu CloudHealth use the platform to allocate Reserved Instance and Savings Plans benefits based on who used the discount, rather than by who purchased it. This provides the visibility needed to perform accurate cost showback or chargeback at a granular level.

Amortizing upfront costs from Savings Plans and Reserved Instances

Similarly, amortization for costs related to Reserved Instances and Savings Plans is another common challenge. Simply put, amortization is a way to spread out a capital expense (in this case, Savings Plans or Reserved Instance purchases) over the period of time that your business will benefit from the

expense. Both Savings Plans and Reserved Instances offer options to pay all upfront, pay partial upfront, or pay nothing upfront, with the amount of the discount varying by the different payment options. Because none of the reservation is paid for at the start with the no upfront payment option, only the all upfront and partial upfront payment options are candidates for amortization.

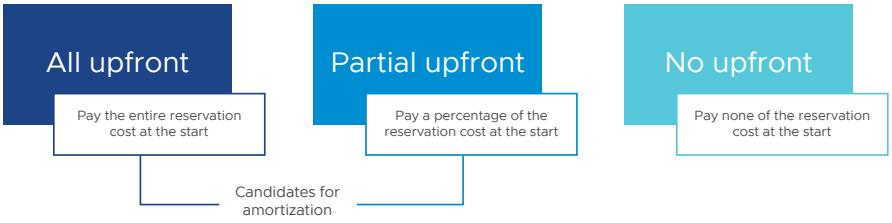

Figure 1: Payment terms for Reserved Instances and Savings Plans.

Because AWS tracks costs based on the account that made the purchase, the amortized reservation cost is also attributed to the purchasing account. You end up with the same situation discussed in the previous point, where it's still difficult to know which team is responsible for the usage/credit of the discount; you only know who purchased it.

Because Tanzu CloudHealth tracks the usage of the resources purchased via these discount programs, the amortized costs can also be applied at the usage level, offering a more granular cost allocation approach.

Customizing views into data based on relevant KPIs

Most organizations need to slice and dice their cost, usage, performance, availability and security data in a variety of ways, and will change their reporting structures over time in response to the requirements of different stakeholders.

However, many organizations can struggle to provide relevant insights on their cloud management efforts based on several disparate sources of data. This is even more difficult for organizations that don't have 100 percent adherence to their resource tagging policies. Improperly tagged resources will not be tracked in AWS cost visibility tools, leaving the potential for significant blind spots in the environment.

These needs also exacerbate the manual work related to maintaining cost visibility because AWS customers will need to update their reports manually in response to staff or project changes.

Preserving historical information

If an asset's tag is modified or that asset is deleted, AWS tools will lose the history of that asset. This can cause real challenges for AWS customers trying to understand TCO or responding to audit and compliance requests.

Tanzu CloudHealth maintains a historical record of all assets over their lifecycle, even for assets that have been modified or deleted.

Container cost visibility

Organizations embracing AWS services for containerized workloads will need to ensure their processes are able to account for the unique cloud financial management challenges that come with them.

AWS tools provide visibility into the cost of underlying infrastructure for containerized workloads, such as Amazon Elastic Compute Cloud (EC2) instances. This can be helpful but lacks the kind of granular visibility needed to understand who in the organization is consuming cluster resources or whether the cluster is leveraging the right mix of resources.

Tanzu CloudHealth customers have visibility at the service and cluster levels to understand the mix of resources being used within clusters, and then to map that back to the teams using them.

Cost visibility across multiple clouds

When it comes to budgeting and measuring TCO, public cloud cost data can't be limited to just the AWS environment. Even if your organization operates in just the AWS cloud today, it may not be long before your teams begin to embrace a multi-cloud approach, leveraging services offered by other cloud providers. In 2020, our global assessment of cloud management maturity found that 46.7 percent of respondents reported operating in multiple clouds (public and/or private), while just 24.3 percent reported operating in a single public cloud environment.

While access to a diverse range of options for infrastructure offers enhanced flexibility, it can also increase the complexity of cloud management. Many organizations quickly find the need to aggregate visibility and reporting for costs across all environments.

The cost optimization challenge

Challenge: I need easy ways to identify and eliminate unnecessary cost drivers in my cloud environment

Once an organization achieves visibility into their cloud environment, they can progress to the next phase of cloud management maturity: optimization. Optimization is the process of finding opportunities to be more efficient and reduce spend or save time, without sacrificing functionality or resources needed to meet your broader business objectives.

Without the right toolset, many AWS customers can easily overprovision their resources and spend more than needed. For example, engineers may be driven to provision the largest possible machine for a workload to ensure 100 percent coverage, even if only 10 percent of available resources are actually used throughout most of the year.

AWS offers a number of tools intended to support customers in this space.

How AWS tools address the cost optimization challenge

AWS Trusted Advisor

This tool provides guidance to help customers provision and deploy services in line with AWS best practices, including the cost optimization pillar of the AWS Well-Architected Framework.

Amazon CloudWatch anomaly detection

Based on historical usage patterns, the anomaly detection feature will look for standard patterns of cloud usage and costs, and send notifications if behavior deviates from that expected behavior.

AWS Compute Optimizer

Rightsizing, or the practice of aligning the resources provisioned with the actual needs of the workload, can be one of the most effective ways to reduce spend and optimize the performance of your cloud infrastructure. AWS Compute Optimizer provides rightsizing recommendations to improve cost and performance for workloads based on EC2 instances, Amazon Elastic Block Store (EBS), and AWS Lambda.

What you need to consider about AWS tools for cost optimization

These tools provide important functionality to help AWS customers identify inefficiencies in their environment, and can help those early in their cloud journey encourage their teams to think critically about costs and usage. As cloud usage grows, keep the following important factors in mind.

Additional costs and limited scope

Amazon CloudWatch is adequate for monitoring the utilization of most AWS services but can incur additional costs, typically due to using a high number of custom metrics, exceeding dashboard and reporting limitations, and/or having unchecked ingested data or PutMetricData calls. AWS customers will need to anticipate how their requirements and these additional costs affect the net savings generated as a result of their CloudWatch usage.

Additionally, AWS Compute Optimizer's EC2 rightsizing recommendations are restricted to a select number of regions and instance types, thereby reducing the scope of cost optimization efforts for those who rely entirely on the tool.

Reservations and discounts

AWS Cost Explorer can be used to produce Savings Plans purchasing recommendations, but it will always recommend the largest potential purchase with no ability to tune or refine options.

Savings Plans Recommendations from Tanzu CloudHealth offer users the ability to build out quotes for comparison based on what-if scenarios to evaluate potential coverage and savings with different evaluation periods, committed spend levels, and targeted coverage. Customers can then purchase Savings Plans directly within the Tanzu CloudHealth platform.

Finally, AWS tools are only able to make reservation recommendations for AWS services. Tanzu CloudHealth offers recommendations and manages reservation lifecycles across AWS, Microsoft Azure, and other cloud service providers.This is important for maximizing the total benefit of discount pricing across clouds.

Limited support for additional cost optimization opportunities

In addition to rightsizing instances and taking advantage of discount pricing options, effective cloud cost optimization efforts should also consider additional sources of wasted spend in the environment. For example,

unattached EBS volumes—which are usually attached to act as the local block storage for the application when a new instance is launched—can linger even after the instance is terminated. At scale, unattached EBS volumes can generate thousands of dollars of unnecessary spend and are one of the more common challenges for those in the optimization phase of their cloud journey.

AWS tools can help customers find unattached resources, such as EBS volumes, but require a significant amount of manual work to complete successfully and at scale. Tanzu CloudHealth incorporates EBS volumes as part of a proactive cloud cost optimization strategy, sending notifications about unattached resources across multiple cloud environments, and enabling customers to configure policies that will delete them automatically.

Limited visibility into performance data

As AWS customers provision instances and storage to match workloads, Cost Explorer can make recommendations based on CPU and disk. However, this is only part of the picture when it comes to workload performance.

Tanzu CloudHealth integrates with VMware Aria Operations™ for Applications as well as with third-party tools, such as New Relic and Datadog, to add information and custom metrics around memory and network to ensure every optimization recommendation is all-encompassing. Customers can push performance metrics to the Tanzu CloudHealth platform and retrieve metrics for specific resources, time periods, and time granularity (e.g., hourly, daily, monthly) to make more informed decisions about workload efficiency.

The cost governance challenge

Challenge: I need to ensure my teams adhere to policies to stay within budget and avoid unnecessary costs

Governance is the process of defining and implementing policies on cloud usage in line with the overall cloud strategy and objectives, which include optimizing spend and staying within budget.

Establishing automation helps enforce these rules and policies at scale, so your teams only have to take action when notified of a policy violation rather than having to look for policy violations and optimization opportunities. When it comes to cost optimization, many organizations will establish policies that notify leaders when their teams are projected to exceed budget or take automated action in response to activity that might lead to unnecessary spend.

AWS tools allow users to create automated policies to support cloud financial management, but with some limitations and caveats that customers should know before moving forward.

How AWS tools address the governance challenge

AWS Budgets

Once customers have established a cost threshold, the AWS Budgets tool will send automatic notifications when costs are forecasted to exceed that amount, and can be configured to trigger automated Lambda functions in response to activity (such as shutting down an instance if it will result in a budget overrun).

AWS Tag Policies

Because so many AWS management tools depend on consistent resource tagging, AWS offers the Tag Policies tool to enable customers to define tagging policies that apply to accounts and groups established in AWS Organizations.

AWS Systems Manager and AWS Command Line Interface

AWS customers can configure policies and automation in response to cost increases by leveraging the Systems Manager and Command Line Interface tools.

What you need to consider about AWS tools for cost governance

Governance is critical for effective cloud cost management. AWS customers can establish some policies for their environment with tools available in AWS but may struggle to implement an effective governance practice that encompasses all cloud usage. Keep the following considerations in mind.

Limitations for basic tagging policies

AWS customers should be aware that the Tag Policies tool can only be used in conjunction with AWS Organizations, and that it only supports a select few regions.

Another important aspect to keep in mind is that customers using AWS Tag Policies will need to anticipate all potential tag and key/value pairs in advance, and will not receive notifications for any usage that does not align with those expectations.

Manual work and additional costs required for policy enforcement

Cost management policies often follow one of two formats

- Alerts (e.g., if total costs increase by more than 20 percent in one week, alert me)
- Automated actions (e.g., if a user takes action X, trigger action Y automatically)

For alert-based notifications, AWS customers can use the AWS Command Line Interface and the Amazon Simple Notification Service to trigger alerts in response to certain actions. Similarly, AWS Systems Manager can be configured to trigger an automated action in conjunction with the AWS Command Line Interface.

However, this requires manual scripting to support multiple AWS regions and accounts, and it's dependent on accurate tagging. Automation fails to run on resources that don't have the specified tag or that aren't included in the specified resource group.

Additionally, AWS customers are charged for running automation in multiple regions and accounts, which can quickly drive up costs if not monitored carefully.

Customers of Tanzu CloudHealth configure policies directly from the platform's interface based on custom-defined guidelines: start, stop, terminate or reboot instances; run lights-on/lights-off policies; detect and eliminate unattached volumes; and more. Automation can be set up without coding, so business users can set governance policies without IT support.

Support for multiple clouds

Governance policies via AWS tools will not provide equivalent support for usage and costs from other public cloud service providers. Mature cloud governance strategies extend universal policies across their entire multi-cloud environment.

The Tanzu CloudHealth policy engine monitors multi-cloud environments for usage violations and will alert stakeholders proactively if provisioned resources violate those guidelines. Automated policies can also be configured to take immediate action in response to some of the more common behaviors that can contribute to wasted cloud spend.

The business integration challenge

Challenge: I need to bake cloud cost optimization into my teams' day-to-day operations and my broader organization's planning and reporting

The fourth and final phase in our framework for maturity in cloud management is business integration. In terms of cloud financial management, business integration includes several aspects.

Integration with the tools required for day-to-day operations

Successful business integration strategies align notifications from their cost governance policies with tools, such as email or Slack, as well as with cloud financial management data, to budgeting and accounting software so that accruals and chargeback can flow automatically.

Integration with reporting and planning

This involves establishing cloud financial management KPIs that integrate with decisions around budgeting, TCO, cost of goods sold, and pricing for products and services. This ensures the business can justify net increases in cloud spend and reap the benefits of any reductions in waste.

The data from the variety of AWS tools for cost management can be helpful here, but integrating into your organization's broader systems will require significant manual work.

Tanzu CloudHealth consolidates and analyzes data from multiple data streams, including common solutions such as Datadog, New Relic, and VMware Aria Operations for Applications, to bring you end-to-end visibility across your cloud environment to make more informed business decisions.

What you need to consider about business integration

When choosing a tool to help integrate cloud financial management into your business processes, consider the following capabilities.

Centralized data for infrastructure costs

Support for multiple public clouds is important here, as is the ability to ingest data from data centers and point solutions reflecting performance across your cloud infrastructure, to provide a single source of truth for your business.

One additional note for business integration is that AWS tools only align with the calendar year. Tanzu CloudHealth supports budgeting and forecasting that aligns with customizable fiscal year date ranges.

Partner services

If you're a managed service provider looking to provide cloud services to your customers, the Tanzu CloudHealth platform provides a robust partner platform that enables you to bring the cloud management benefits previously discussed to your customers. This includes Customer Health Analytics, a detailed analysis of the health of your cloud business and the health of your customers' cloud environment, benchmarked against their peers.

Benchmarking and support

One often overlooked aspect of cloud financial management is difficulty with benchmarking. Put simply, how do you know whether your AWS costs are more or less efficient than others operating in the AWS cloud?

While AWS tools will provide basic visibility into the cost efficiency of a customer's own workloads, customers of Tanzu CloudHealth value the ability to benchmark against the broader Tanzu CloudHealth community (more than 15,000 customers worldwide) through a quarterly business review (QBR) process. One customer, for example, used this process to kick-start their own internal QBR process to share lessons learned across the organization, and discuss new approaches in their cloud financial management process.

Conclusion

A mature cloud financial management practice is essential to stay ahead of the challenges that come with managing and optimizing cloud costs. AWS offers various tools to help alleviate these challenges, but many customers find that these tools do not provide the visibility, operational efficiency, or information management capabilities they need as they scale their cloud footprint and advance in their cloud journey.

This white paper outlined the key capabilities organizations should consider when evaluating the tools they'll use to support their cloud financial management practice at each phase of the cloud management maturity framework. Ultimately, the choice is up to each organization to decide which tools, or combination of solutions, will best suit the needs of their business.

If you're looking for more detailed information into the differences between AWS tools and Tanzu CloudHealth, we encourage you to set up a conversation with one of our experts. Our team would be happy to answer any questions you may have, and demonstrate how the platform can help with your holistic cloud financial management practice.

Item No: 1703106aq-wp-comp-aws-tools-a4 2/23