

Maximizing Value with AWS

Achieve Total Cost of Operation Benefits
Using Cloud Computing

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Abstract

Amazon Web Services (AWS) provides rapid access to flexible and low cost IT resources. With cloud computing, public sector organizations no longer need to make large upfront investments in hardware, or spend time and money on managing infrastructure. The goal of this whitepaper is to help you gain insight into some of the financial considerations of operating a cloud IT environment and learn how to maximize the overall value of your decision to adopt AWS.

Introduction

A core reason organizations adopt a cloud IT infrastructure is to save money. The traditional approach of analyzing Total Cost of *Ownership* no longer applies when you move to the cloud. Cloud services provide the opportunity for you to use only what you need and pay only for what you use. We refer to this new paradigm as the Total Cost of *Operation*. You can use Total Cost of Operation (TCO) analysis methodologies to compare the costs of owning a traditional data center with the costs of operating your environment using AWS Cloud services.

Eliminate Upfront Sunk Costs

Organizations considering a transition to the cloud are often driven by their need to become more agile and innovative. The traditional capital expenditure (CapEx) funding model makes it difficult to quickly test new ideas. The AWS Cloud model gives you the agility to quickly spin up new instances on AWS, and the ability to try out new services without investing in large upfront, sunk costs (costs that have already been incurred and can't be recovered). If you are using the cloud you can return CapEx to the general fund and invest in activities that better serve your constituents.

AWS helps lower customer costs through its “pay only for what you use” pricing model. To get started, it is critical to understand how to measure value, improve the economics of a migration project, manage migration costs and expectations through large-scale IT transformations, and optimize the cost of operation.

Launch an Amazon EC2 Instance for Free

The AWS Free Tier lets you gain free, hands-on experience with AWS products and services.

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.

[View AWS Free Tier Details »](#)

Create a Culture of Cost Management

All teams can help manage costs, and cost optimization should be everyone's responsibility. There are many variables that affect cost, with different levers that can be pulled to drive operational excellence. By using resources like the AWS Trusted Advisor dashboard and the AWS Billing Cost Explorer tool, you can get real-time feedback on costs and usage that puts you on the road to operational excellence.

- Put data in the hands of everyone – This reduces the feedback loop between the information/data and the action that is required to correct usage and sizing issues.
- Enact policies and evangelize – Define and implement best practices to drive operational excellence.
- Spend time training – Educate staff on the items that affect cost and the steps they can take to eliminate waste.
- Create incentives for good behavior – Have friendly competitions across teams to encourage cost efficiencies throughout the organization.

To achieve true success, cost optimization must become a cultural norm in your organization. Get everyone involved. Encourage everyone to track their cost optimization daily so they can establish a habit of efficiency and see the daily impact over time of their cost savings.

Although everyone shares the ownership of cost optimization, someone should be tasked with cost optimization as a primary responsibility. Typically, this is someone from either the finance or IT department who is responsible for ensuring that cost controls are monitored so that business goals can be met. The “cost optimization engineer” makes sure that the organization is positioned to derive optimal value out of the decision to adopt AWS.

Driving Cost Optimization

By moving to the consumption-based model of the cloud you can increase innovation within the organization. However, one of the biggest challenges of the consumption-based model is the lack of predictability.

You need to balance agility and innovation against cost. As multiple teams spin up instances to test new ideas, it is important to control and optimize AWS spending as cloud usage increases. Don't target cost savings as the end goal. Instead, optimize spending by focusing on business growth opportunities that can result from innovative ideas. The following table contrasts the traditional funding model against the cloud funding model.

Funding Model	Characteristics
Traditional Data Center	<ul style="list-style-type: none">• A few big purchase decisions are made by a few people every few years.• Typically overprovisioned as a result of planning up front for spikes in usage.
Cloud	<ul style="list-style-type: none">• Decentralized spending power.• Small decisions made by a lot of people.• Resources are spun up and down as new services are designed and then decommissioned.• Cost ramifications felt by the organization as a whole are closely monitored and tracked.

Give stakeholders access to your spending fundamentals. The data is there. Share it. By using dashboards, you can quickly highlight spending habits across your teams.

- Actively manage workloads. Turn services on and off as needed rather than running them 24/7.
- Eliminate surprises. Provide visibility into costs by making dashboard review a daily habit.
- Make cost optimization a joint effort. Have “spenders” (those spinning up resources) work closely with “watchers” (finance and leadership who can track to business goals).
- Allocate charges (or show departmental usage) to organizations actually using services. This provides insight into each group's impact on business goals.
- Savings. Know who uses services and how they use services. To select the best rate, evaluate pricing options that best meet the workload.
- Tie spending to business metrics. Determine what gets measured, track usage, and identify areas for improvement.

- Use innovative approaches to optimize spend. Consider policies such as “default off” for test and dev environments as opposed to 24/7 or even “on during business hours.”

Total Cost of Operation

A pay-as-you-go model reduces investments in large capital expenditures. In addition, you can reduce the operating expense (OpEx) costs involved with the management and maintenance of data. This frees up budget, allowing you to quickly act on innovative initiatives that can’t be easily pursued when managing CapEx.

A clear understanding of your current costs is an important first step of a cloud migration journey. This provides a baseline for defining the migration model that delivers optimal cost efficiency.



Our online total cost of ownership calculators allow you to estimate cost savings when using AWS. These calculators provide a detailed set of reports that you can use in executive presentations. The calculators also give you the option to modify assumptions so you can best meet your business needs.

Ready to find out how much you could be saving in the AWS Cloud? Take a look at the [AWS Total Cost of Ownership Calculator](#).

Start with an Understanding of Current Costs

Evaluate the following when calculating your on-premises computing costs:

- **Labor.** How much do you spend on maintaining your environment?
- **Network.** How much bandwidth do you need? What is your bandwidth peak to average ratio? What are you assuming for network gear? What if you need to scale beyond a single rack?
- **Capacity.** How do you plan for capacity? What is the cost of over-provisioning for peak capacity? What if you need less capacity? Anticipating next year?

- **Availability/Power.** Do you have a disaster recovery (DR) facility? What was your power utility bill for your data centers last year? Have you budgeted for both average and peak power requirements? Do you have separate costs for cooling/ HVAC? Are you accounting for 2N (parallel redundancy) power? If not, what happens when you have a power issue to your rack?
- **Servers.** What is your average server utilization? How much do you overprovision for peak load? What is the cost of over-provisioning?
- **Space.** Will you run out of data center space? When is your lease up?

Total Cost of Migration

To achieve the maximum benefits of the AWS Cloud, it is important to understand and plan for the financial costs associated with migrating workloads to AWS. While there isn't yet a simple calculation for the total cost of migration (TCM), it is possible to estimate the cost and duration of the migration phase based on the experiences of others. Some of the inputs for TCM include the following:

- IT staff will need to acquire new skills.
- New business processes will need to be defined.
- Existing business processes will need to be modified.
- Cost of discovery and migration tooling needs to be calculated.
- Duplicate environments will need to run until one is decommissioned.
- Penalties could be incurred for breaking data center, colocation, or licensing agreements.

AWS uses the term *migration bubble* to describe the time and cost of moving applications and infrastructure from on-premises data centers to the AWS Cloud. Although the cloud can provide significant savings, certain costs may increase as you move into the migration bubble. It is important to understand the costs associated with migration so that you can work to shrink the size of the migration bubble and accomplish the migration in a quick and sustainable manner.



Figure 1: Migration bubble

To realize cost savings, it is important to plan your migration to coincide with hardware retirement, license and maintenance expiration, and other opportunities to be frugal with your resources. In addition, the savings and cost avoidance associated with a full all-in migration to AWS can help you fund the migration bubble. You can even shorten the duration of the migration by applying more resources when appropriate.

For more information, read the [AWS Cloud Adoption Framework whitepaper](#).

Select the Right Plan for Specific Workloads

Depending on your needs, you can choose among three different ways to pay for Amazon Elastic Compute Cloud (EC2) instances: On-Demand, Reserved Instances, and Spot Instances. You can also pay for Dedicated Hosts that provide you with EC2 instance capacity on physical servers dedicated for your use.

Purchasing Options	Description	Recommended for
On-Demand Instances	<p>Pay for compute capacity by the hour with no long-term commitments or upfront payments.</p> <ul style="list-style-type: none"> Increase or decrease compute capacity depending on the demands of your application. Only pay the specified hourly rate for the instances you use. 	<ul style="list-style-type: none"> Users that want the low cost and flexibility of Amazon EC2 without any upfront payment or long-term commitment. Applications with short-term, spiky, or unpredictable workloads that cannot be interrupted. Applications being developed on AWS the first time.
Reserved Instances	<p>Can provide significant savings compared to using On-Demand instances.</p> <ul style="list-style-type: none"> Sunk cost, but the longer-term commitment delivers a lower hourly rate. 	<ul style="list-style-type: none"> Applications that have been in use for years, and that you plan to continue to use. Applications with steady state or predictable usage. Applications that require reserved capacity. Users who want to make upfront payments to further reduce their total computing costs.
Spot Instances	<p>Provide the ability to purchase compute capacity with no upfront commitment and lower hourly rates.</p> <ul style="list-style-type: none"> Allow you to specify the maximum hourly price that you are willing to pay to run a particular instance type. 	<ul style="list-style-type: none"> Applications that have flexible start and end times. Applications that are only feasible at very low compute prices. Users with urgent computing needs for large amounts of additional capacity.
Dedicated Hosts	<p>Physical EC2 servers with instance capacity fully dedicated for your use.</p> <ul style="list-style-type: none"> Help reduce costs by using existing server-bound software licenses. Can provide up to a 70% discount compared to the On-Demand price. 	<ul style="list-style-type: none"> Users who want to save money by using their own per-socket or per-core software in Amazon EC2. Users who deploy instances using configurations that help address corporate compliance and regulatory requirements.

Learn more about [Amazon EC2 Instance Purchasing Options](#).

Employ Best Practices

As your organization transitions to the cloud and you pilot new cloud initiatives, be careful to avoid common pitfalls. The best practices presented below can help you.

Determine Top-Line Business Metrics

To fully benefit from the cloud, it is important to map business goals to specific metrics so that you can evaluate where changes need to be made. Define the metrics that provide the most useful data to track your service, such as user, subscriber, customer access, API calls, and page views. Dashboards are an excellent source of information and provide instant feedback on how services are delivering against specific goals.

Stay on Top of Instance Utilization

Oversight is an excellent practice to make sure that you are not overspending. Monitoring tools provide visibility, control, and optimization. Post DevOps, use dashboards to monitor how services are used, as well as your current spending profile. If your monthly bill goes up, make sure it is for the right reason (business growth) and not the wrong reason (waste).

- Choose a cadence, and regularly measure results for services that have moved to the cloud.
- Use tools that track performance and usage to reduce cost overruns. It only takes five minutes to resize – up or down – to ensure that the service is providing the desired performance level.
- Keep track of running instances. Optimize the size of servers and adjust as needed, rather than overprovisioning from the start.
- If an instance is underutilized, determine if you still need the instance, if it can be shut down, or if it needs to be resized.
- As AWS introduces new technology, find and then upgrade your legacy instances so that you can lower costs. This can provide substantial savings over time.

Distribute Daily Spending Updates

Make usage reviews a daily habit for all team members. Provide weekly reporting to elevate visibility and drive accountability across large, complex organizations.

Have teams review bills associated with their projects to identify ways to optimize for costs during dev/test, as well as production. And, to create an

atmosphere of friendly competition, create a leaderboard that highlights teams with the best cost efficiencies.

Every Engineer Can Be a Cost Engineer

Engineers should design code so that instances only spin up when needed, and spin down when not in use. There is no need to have AWS services running 24/7 if they are only used during standard work hours. Turn off underutilized instances that you discover using dashboards and reports.

- Innovate. Spin up instances to test new ideas. If the ideas work, keep the instance for further refinement. If not, spin it down.
- Build sizing into architecture. Use tagging to help with cost allocation. Tagging allows you to track the users of particular instances, optimize usage, and bill back or show charges by department or user.
- Schedule dev/test. Eliminate waste of resources not in use.

Eliminate Waste

Default = Off is a good best practice.

Build Automation into Services

Automation can accelerate the migration process.

- Automate processes so that they turn off when not in use to eliminate waste.
- Automate alerts to show when thresholds have been exceeded.
- Configuration management. With automation, every machine defined in code spins up or down as needed to drive performance and cost optimization.
- Set alerts on old snapshots, oversized resources, and unattached volumes and then automate and rebalance for optimal sizing.
- Eliminate troubleshooting. If an instance goes down, spin up a new one. Stop wasting time on unproductive activities.

Implement a Reservation Process

Appoint someone to own the reservation process (typically a finance person). Buy on a regular schedule, but continually track usage and modify reservations as needed. This can result in big savings over time.

See [How to Purchase Reserved Instances](#) for more information.

Conclusion

Moving business applications to the AWS Cloud helps organizations simplify infrastructure management, deploy new services faster, provide greater availability, and lower costs. Having a clear understanding of your existing infrastructure and migration costs, and then projecting your savings will help you calculate payback time, project ROI, and maximize the value your organization gains from migrating to AWS.

AWS delivers a mature set of services specifically designed for the unique security, compliance, privacy, and governance requirements of large organizations. With a technology platform that is both broad and deep, professional services and support organizations, robust training programs, and an ecosystem that is tens-of-thousands of partners strong, AWS can help you move faster and do more.

Contributors

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