

# Introduction to AWS Economics

Reducing Costs and Complexity

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# Contents

Abstract	4
Introduction	5
Advantages of Cloud Technology	6
Reduce Costs and Complexity	7
Increase Flexibility	8
AWS Economics	8
Cost Drivers	10
Pricing Model	11
Flexibility	13
Storage and Data Transfer	13
Testimonials	14
Conclusion	15



## Abstract

Considering the expense and complexity of maintaining a traditional data center, it's no wonder that companies are turning to cloud computing as a way to reduce costs, increase efficiencies, and build their business. With cloud computing, companies have access to a scalable platform; low-cost storage; database technologies; and management, deployment, and development tools on which to build enterprise-level solutions. Cloud computing helps businesses in the following ways:

- Reduces costs and complexity
- Adjusts capacity on demand
- Reduces time to market
- Increases opportunities for innovation
- Enhances security

Amazon Web Services (AWS) gives customers access to cloud services at competitive prices, with the flexibility to meet their business needs. Whether it's a small startup or a large enterprise, all companies can leverage the features and functionality of AWS to improve performance and increase productivity.

# Introduction

Weighing the financial considerations of operating a data center versus using cloud infrastructure is not as simple as comparing hardware, storage, and compute costs. Whether you own your own data center or rent space at a colocation facility, you have to manage investments, whether directly or indirectly, including but not limited to:

- Capital expenditures
- Operational expenditures
- Staffing
- Opportunity costs
- Licensing
- Facilities overhead

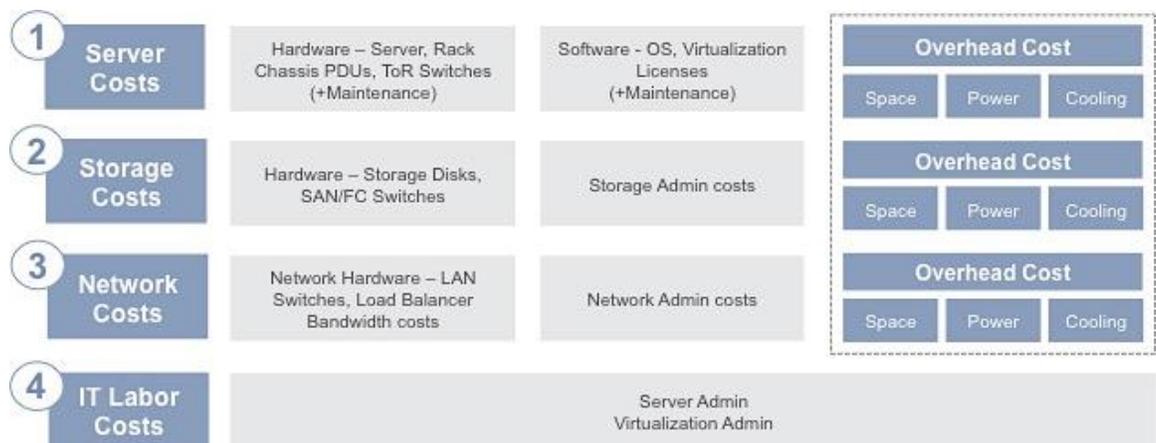


Figure 1: Typical Data Center Costs

If you’re considering an expansion of your data center or colocation footprint, here are some questions to ask:

## Capacity planning

- How many servers will be added this year? What are the forecasts for the next year and beyond?
- Can hardware be turned on and off when it's not being used?
- How does the pricing model work?

### Utilization

- What is the average server utilization?
- How much needs to be provisioned for peak load?

### Operations

- Are facilities adequate for expansion?
- Is the organization ready for international expansion?
- Can utilities (electricity, cooling) be measured accurately and does budget cover both average and peak requirements?

### Optimization

- Can we provide automatic scaling of our current infrastructure, or the ability to “reserve” capacity?
- What if we need to quickly expand the infrastructure? What costs come into play?

## Advantages of Cloud Technology

As the technology has matured over the last decade, companies are moving to the cloud to lower costs, reduce complexity, and increase flexibility. The cloud provides scalable and powerful compute solutions, low-cost, reliable storage, and database technologies that meet the most demanding workload requirements. In addition, cloud technologies can be used to deploy solutions quickly and cost-effectively around the world and on any device.

When you decouple from the data center, you'll be able to:

- **Decrease your TCO:** Eliminate many of the costs related to building and maintaining a data center or colocation deployment. Pay for only the resources you consume.

- **Reduce complexity:** Reduce the need to manage infrastructure, investigate licensing issues, or divert resources.
- **Adjust capacity on the fly:** Add or reduce resources, depending on seasonal business needs, using infrastructure that is secure, reliable, and broadly accessible.
- **Reduce time to market:** Design and develop new IT projects faster.
- **Deploy quickly, even worldwide:** Deploy applications across multiple geographic areas.
- **Increase efficiencies:** Use automation to reduce or eliminate IT management activities that waste time and resources.
- **Innovate more:** Spin up a new server and try out an idea. Each project moves through the funnel more quickly because the cloud makes it faster (and cheaper) to deploy, test, and launch new products and services.
- **Spend your resources strategically:** Switch to a DevOps model to free your IT staff from operations and maintenance that can be handled by the cloud services provider.
- **Enhance security:** Spend less time conducting security reviews on infrastructure. Mature cloud providers have teams of people who focus on security, offering best practices to ensure you're compliant, no matter what your industry.

## Reduce Costs and Complexity

By moving from a traditional data center to the cloud, you can reduce or eliminate the overhead related to managing a data center. In addition to reducing costs for hardware, software, storage, and networks, your IT organization can become a profit center instead of a cost center.

From a facilities perspective, space issues, cooling costs, and leases become a thing of the past. From a management perspective, so do servers, racks, storage devices, networking equipment, and licensing. The cloud gives you access to the latest software when you need it, enabling you to keep up with trends in technology without incurring high costs.

Perhaps best of all, you no longer have to deal with the legacy systems that may be blocking efficiencies for you now. Decommissioning existing infrastructure can be done with the click of a button.

## Increase Flexibility

Moving to the cloud lets you respond to market needs and opportunities immediately—without a lengthy procurement process, licensing issues, or increasing data center staff to accommodate a sudden surge.

The barriers to entry are significantly reduced, too. Many companies find that the costs of cloud computing are so low, they can move as much or as little of their environment to the cloud without having to make a business case to pursue an idea. Your organization can fail fast, without significant investments in either hardware or staff time.

You can also budget according to your business needs. If your requirements or strategic priorities change or if demand varies, you can expand or contract your cloud footprint as often as you need to.

Moving to the cloud doesn't have to be a binary proposition. You can move as much or as little of your infrastructure to the cloud as suits your business. For example, many AWS customers start with a small pilot project and develop their cloud use as business needs dictate.

## AWS Economics

The AWS infrastructure serves more than one million active customers in over 190 countries and offers the following benefits to its users:

- **Global operations:** AWS operates across six continents, offering multiple Availability Zones in each of the 11 geographic areas known as regions. To achieve the greatest possible fault tolerance and stability, we isolate regions from one another. You can put your resources in multiple locations to reduce latency and improve performance. Resources aren't replicated across regions unless you choose to do so.

- **High availability:** AWS operates state-of-the-art, highly available data centers. Although rare, failures that affect the availability of instances in the same location can occur. If you host all of your instances in a single location that is affected by such a failure, none of your instances will be available. For that reason, you may choose to replicate data in different Availability Zones to ensure swift recovery in case of disaster.
- **Low costs due to high volume:** The scale and operations of AWS support lower costs and higher efficiencies than those in most on-premises data centers. These efficiencies are a result of overall supply chain optimization, high levels of automation, and volume-based purchasing.
- **Only pay for what you use:** AWS allows users to consume only the services you need, for as long as you need them and with no complex agreements or licensing dependencies. There are no termination clauses or hidden fees.
- **Economies of scale:** AWS has developed hardware and software that is optimized for large-scale clouds. We have acquired manufacturers of customer servers and net gear, delivering capabilities required for large-scale deployments. Similarly, through direct purchases of disk, memory, and CPU, AWS can drive economies of scale that are otherwise difficult to replicate.
- **Financial flexibility:** AWS helps customers reduce large capital investments with lower variable costs. AWS also gives customers the opportunity to work on their own terms without long-term lock-in, reducing the risks from unplanned capacity and demand. AWS helps finance teams plan and forecast more effectively, while giving IT teams the capacity and resources they need, even during peak periods.

The following figure shows a comparison of costs across traditional data centers, virtualized data centers, and AWS.

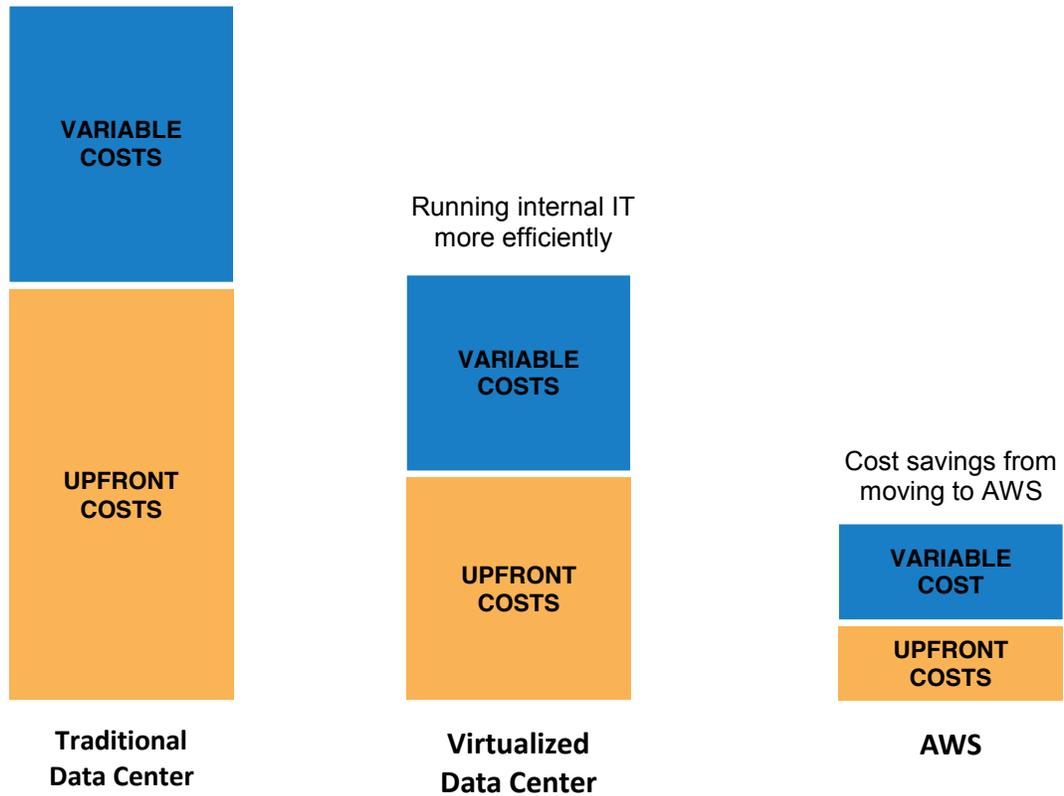


Figure 2: Cost Comparison of Data Centers and AWS

### Cost Drivers

The following table breaks down common cost drivers in a data center.

Category	\$ Impact over 60 months (excl. labor)	Cost Driver
Server Hardware	32% of total	Bare metal servers and virtual machine physical hosts must be replaced.
Data Center Facilities Costs	20% of total	Monthly operational costs (lease, power, and cooling) and maintenance (generators, electrical equipment).

<b>Storage Hardware</b>	25% of total	Storage hardware must be replaced.
<b>Server Hardware Maintenance</b>	9% of total	Annual maintenance costs, calculated at 15% of purchase price per year.
<b>Network Hardware</b>	7% of total	Network equipment in the data center (routers, arrays, switches, cabling) must be replaced.

### Pricing Model

AWS has been developing cloud technology since the early days. Our user base has given us the advantage of having economies of scale. Last year, Gartner estimated that AWS had five times the cloud capacity of its nearest 12 competitors combined.

The AWS pricing philosophy is driven by a virtuous cycle: the already low AWS prices reduce the barrier to entry for customers, which means more customers take advantage of AWS, further driving down costs.

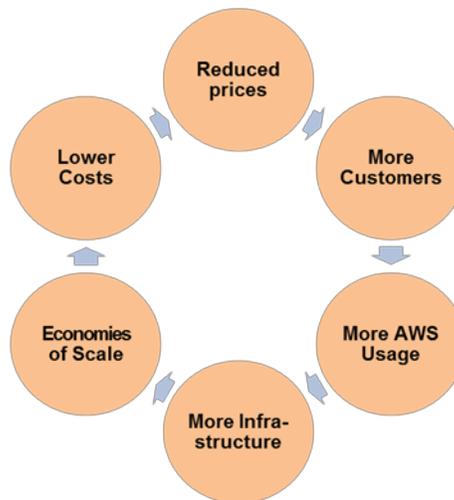


Figure 3: AWS Virtuous Circle

AWS offers a simple, consistent, pay-as-you-go pricing model, so you are charged only for the resources you consume. Moreover, with AWS there are no upfront fees, no minimum commitment, and no long-term contracts required.

Some AWS products are available through multiple pricing models that give you the flexibility to acquire services in a way that best fits your needs.

- **On-Demand Instance:** With on-demand instances, you pay for compute capacity by the hour, with no minimum commitments required.
- **Reserved Instance:** For longer-term savings, you can purchase in advance. In addition to providing a significant discount (up to 60 percent) compared to On-Demand Instance pricing, Reserved Instances allow you to reserve capacity.
- **Spot Instance:** You can bid for unused Amazon Elastic Compute Cloud (Amazon EC2) capacity. Instances are charged the Spot Price, which is set by Amazon EC2 and fluctuates, depending on supply and demand. For more information, see [Amazon EC2 Spot Instances](#).
- Pricing is tiered for storage and data transfer. The more you use, the less you pay per gigabyte (GB). Volume discounts are also available.

The following table compares one-year and three-year savings from the use of reserved instances versus on-demand instances. The figures are based on pricing as of January 2015 on a m3.large Linux instance type in the US East (N. Virginia) region.

	No Upfront	Partial Upfront	All Upfront	On-Demand
<b>1 Year</b>	\$876	\$767.12	\$751	\$1226.40
<b>3 Years</b>		\$1461.40	\$1373	\$3679.20
<b>Savings 1 Year</b>	29%	37%	39%	
<b>Savings 3 Years</b>		60%	63%	

Many large organizations customize their agreements with AWS to further optimize their costs and meet their needs. You can find information in the online communities and in the documentation.

## Flexibility

Not all workloads and applications require the same compute resources. AWS gives you options across multiple instance families to optimize for computing power, memory, GPU, storage, or general purpose. These options give you the flexibility to choose the resources that are right for your workloads.

## Storage and Data Transfer

One of the benefits of the cloud is the increasingly low-cost storage it provides; another is the spectrum of storage solutions available to you. AWS provides low-cost data storage with high durability and availability.

AWS offers storage options for different types of usage—for example:

- Storage infrastructure for storing any amount of data and retrieving it at will.
- Low-cost storage for data archiving and backup, where the data may not be immediately accessible.
- Off-instance storage that persists independently from an instance, sometimes called *block level storage volumes*.
- A file storage service with a simple interface that allows you to create and configure file systems quickly and easily.

The following figure shows pricing as of January 2015 for Amazon Simple Storage Service (Amazon S3).



### Figure 4: AWS Pricing for Storage and Data Transfer

Solutions like Amazon Cloudwatch can help you monitor resource utilization, operational performance, and overall demand patterns. With Auto Scaling, you can ensure that the number of Amazon EC2 instances scale up seamlessly during demand spikes to maintain performance and scale down automatically during demand lulls to minimize costs.

## Testimonials

Y-cam, a provider of video security systems based in the UK, cut its TCO by 80 percent over three years simply by deploying its new HomeMonitor service on AWS. Another AWS customer, [Bookrags](#), an online provider of educational resources, migrated its infrastructure to AWS and reduced its TCO by 50 percent. It also improved availability and scalability.

When Hong Kong's [Comba Telecom](#) wanted to move its SAP Business One financial reporting system from a data center to the cloud, they chose AWS so that they could scale their infrastructure up or down, based on demand. Comba estimated the move would result in a 40 percent savings. Not only did they realize those savings, but they used only 15 percent of the budgeted capital expenditure for the project.

Another example comes from Boston-based [Sonian](#), which offers a data archiving system for government, healthcare providers, and educational organizations. About the company's decision to build a service on AWS, Sonian president George Nichols says, "As we onboard new customers, elastic scaling is a real advantage. We aren't constrained by physical CPUs, so we don't have to limit the number of customers that can sign up."

When Chinese telecom [Qihoo 360](#) expanded internationally, it had a choice to make: it could build its own data centers in the regions it wanted to move to, which would necessitate finding space, building and staffing the data centers, and investigating compliance laws and regulations—or it could simply move to the cloud. By using AWS, Qihoo dramatically lowered its time to market globally, going from testing to production in a matter of days. The company improved customer experience for its overseas customers and lowered its content development network costs by 30 percent. Xiaosheng Tan, vice-president of

Technical Operations, says, “Since AWS has a global infrastructure footprint, it’s an excellent and easy way to expand global business for customers like Qihoo 360 who want to explore overseas markets.”

## Conclusion

Amazon Web Services offers a broad set of global compute, storage, database, analytics, application, and deployment services that help you move faster, lower IT costs, and scale applications. These services are trusted by enterprises and startups alike to power workloads that include web and mobile applications, data processing and warehousing, storage, archive, and others.

AWS supports customers across multiple geographic areas, industries and sizes, consistently offering low prices and industry leading capabilities.

For more information about how AWS can power your business, see [our website](#), [create an account](#), and [contact our Sales department](#).