



Get more performance for your applications at lower costs with AWS

Run virtually any application in the cloud
with high performance and optimal cost

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Abstract

Today's businesses are building and running an increasingly wider variety of applications to improve customer experience, drive operational excellence, and outpace their competition. IT teams are delivering as best they can, but the relentless need for higher performance is stretching budgets and resources to the limit. And the expectations for how far a fixed or limited spend should go are starting to outpace reality.

The mandate is clear: Do more with limited budgets. Thankfully, Amazon Web Services (AWS) offers many ways you can achieve just that.

This eBook takes a deeper look at the AWS services portfolio, which is the broadest and deepest of any cloud provider, and demonstrates how it enables your organization to run virtually any application in the cloud with the best price performance. We'll take a look at some relevant examples from our customers and also outline specific solutions for the most common applications.




What is price performance?

By price performance, we mean getting the best value on your IT infrastructure spend. AWS offers a wide selection of compute, networking, and storage services and capabilities that best suit your application needs. With AWS, you can select the right infrastructure that allows you to optimize both performance and cost for your application, enabling you to drive more business innovation.

Is this eBook for you?

This eBook is primarily designed for technical decision-makers who are interested in achieving better price performance for cloud infrastructure—so they can innovate fast and at scale within a limited budget. It's also written for developers and IT practitioners who need access to infrastructure with capabilities and performance to run their apps—and who want to help get the most out of their organizations' cloud infrastructure spend.

Jump to a specific application section

	Linux-based applications ›
	Windows-based applications ›
	Enterprise databases (SAP / Microsoft SQL Server / Oracle) ›
	Mac-based applications ›
	Content delivery (websites / API / live streaming) ›

The AWS perspective



Dave Brown,
VP, Amazon EC2, AWS

For more than a decade, AWS has envisioned a future where businesses can better serve their customers, streamline their operations, and outpace their competition in the cloud. This vision is swiftly becoming reality—and, in many ways, that future is already here.

Gartner estimates that 85 percent of organizations will embrace a cloud-first principle by 2025, declaring the cloud “the centerpiece of new digital experiences.”¹ But while the cloud offers seemingly limitless opportunity, IT budgets and resources are decidedly finite. To enable businesses to succeed in a cloud-first world, AWS must ensure its technology is transformational and cost-effective at the same time.

And that’s what AWS is all about: helping your organization build and run applications in the cloud, providing the best performance, and helping optimize costs to drive more business innovation for you. As you strive to meet application requirements, satisfy expectations that your users have on application performance, and empower your developers to deliver what’s next, you can count on AWS to provide the performance you need at the best possible price—for applications you run today and those you will build tomorrow.

AWS offers the broadest and deepest portfolio so you can tailor infrastructure to your application needs. We offer compute based on the latest silicon from our partners (Intel, AMD, NVIDIA). We also innovate and build our own silicon specifically designed to further push the price-performance envelope for your applications on AWS. With the **AWS Nitro System**, which is the underlying platform for the latest generation of instances, the **AWS Graviton processors**, which enable the best price performance for a wide range of applications, and the **AWS Inferentia** and **AWS Trainium** chips, which enable acceleration for deep learning applications, we are helping you achieve more performance across a wide variety of applications for every dollar you spend.

Join AWS in building a brighter, better future in the cloud-first world.

How AWS delivers the best price performance

AWS enables you to run virtually any application in the cloud with the best price performance. But how? Let's break it down:

Broadest and deepest portfolio

The AWS Global Cloud Infrastructure is the most secure, extensive, and reliable cloud platform, offering over 200 fully featured services from data centers globally. Customers across virtually every industry and of every size, including startups, small and medium-sized businesses, enterprises, and public sector organizations, are running every imaginable use case on AWS. It all starts with our portfolio of compute, storage, and networking solutions, which is the broadest and deepest of any cloud provider.

Amazon Elastic Compute Cloud (Amazon EC2) provides more than 500 compute instances, with a choice of the latest processors, memory, storage, networking, operating systems, and purchase models to help you best match the infrastructure to the needs of your application. We offer the latest technologies to support a broad set of applications with optimal price performance and are the first major cloud provider that supports Intel, AMD, and Arm processors, the only cloud to provide on-demand instances for building and testing Mac-based applications, and the only cloud with 400 Gbps Ethernet networking for applications that are network-intensive. For your deep learning applications, we offer the best price performance for training, as well as the lowest cost per inference in the cloud. More SAP, high performance computing (HPC), machine learning (ML), and Windows applications run on AWS than any other cloud.

With storage, we help minimize your total cost of ownership (TCO) with services that eliminate infrastructure maintenance and optimize your storage costs based on how frequently and quickly you need to access your data. We are able to minimize cost while keeping performance high. Our object-, file-, and block-based storage services enable millisecond-level latency for even the most data-intensive applications with high resilience.

Finally, we also provide the broadest and deepest set of networking and content delivery services with the highest level of reliability, security, and performance. These services enable you to connect infrastructure and applications across the cloud, the edge, and on-premises environments and deliver differentiated experiences to your users.

Businesses running on AWS

STARTUP	ENTERPRISE	PUBLIC SECTOR	SI & ISV

AWS silicon innovation

We offer compute based on the latest silicon from our partners, including Intel, AMD, and NVIDIA, to provide you with the highest performance the industry offers. But we don't stop there—based on our experience of running applications in the cloud at hyperscale, we also innovate to build our own silicon, which we design from the ground up to take advantage of every aspect of the AWS Cloud.

Our silicon innovations include:

[AWS Nitro System](#)

As the underlying platform for all modern Amazon EC2 instances, the AWS Nitro System enables AWS to innovate faster, further reduce costs for our customers, and deliver added benefits like better security and new instance types. With the AWS Nitro System, Amazon EC2 instances deliver on average a 10 percent higher throughput and up to a 25 percent higher throughput on some applications compared to other major public cloud providers running the same CPU. AWS Nitro SSDs build on AWS silicon innovation with the AWS Nitro System and are custom-designed to deliver the best storage performance for your I/O intensive applications running in Amazon EC2.

[AWS Graviton processors](#)

AWS Graviton processors are custom-designed by AWS to enable the best price performance for a wide variety of applications in Amazon EC2. The latest generation of AWS Graviton3 processors provides up to 25 percent better compute performance² over AWS Graviton2 processors, which already enabled up to a 40 percent better price performance over comparable x86-based instances. Further, AWS Graviton3-based instances are highly energy-efficient, using up to 60 percent less energy for the same performance than comparable Amazon EC2 instances. In addition to Amazon EC2, many AWS services, including Amazon Aurora, Amazon ElastiCache, Amazon EMR, AWS Lambda, and AWS Fargate, also support AWS Graviton2-based instances for a fully managed experience with significant price-performance benefits.

[AWS Inferentia](#) and [AWS Trainium](#)

The AWS Inferentia and AWS Trainium chips are custom-designed by AWS to push the price-performance envelope for deep learning applications. The AWS Inferentia chip is designed to provide high-performance machine learning inference in the cloud while driving down the total cost of inference. Meanwhile, the AWS Trainium chip provides the best price performance for training deep learning models in the cloud. It also offers the highest performance with the most teraflops (TFLOPS) of compute power for the fastest machine learning training in Amazon EC2.

MEET YOUR BUSINESS NEEDS WITH

AWS purchase models

AWS also offers a choice of purchase models and cost-optimization capabilities to help your organization meet its infrastructure needs while staying within your budget.

Free to try

Amazon EC2 is free to try, and the AWS Free Tier includes 750 hours of Linux and Windows t2.micro instances (t3.micro for the regions in which t2.micro is unavailable) each month for one year. You can also get started with AWS Graviton2-based T4g instances for free for up to 750 hours per month.

Flexible compute pricing

There are five ways to pay for Amazon EC2 instances, which we review in detail below. [Learn more about optimizing your Amazon EC2 spend](#)

On-Demand

Pay for compute capacity by the hour or the second depending on which instances you run. No longer-term commitments or upfront payments are needed. You can increase or decrease your compute capacity depending on the demands of your application and only pay the specified on-demand rates for the instance you use.

Spot Instances

Request spare Amazon EC2 computing capacity for up to 90 percent off the On-Demand price.

Savings Plans

Enjoy low prices and up to 72 percent savings on Amazon EC2 and **AWS Fargate** usage in exchange for a commitment to a consistent amount of usage (measured in \$/hour) for a one- or three-year term.

Dedicated Hosts

Get a physical Amazon EC2 server dedicated for your use. Dedicated Hosts can help you reduce costs by allowing you to use your existing server-bound software licenses and by helping you meet compliance requirements. Can be purchased On-Demand (hourly).

ACHIEVING FURTHER SAVINGS WITH

Cost-optimization capabilities

AWS offers too many cost-optimization capabilities to list in this eBook. But we can spotlight two features we're particularly excited about: intelligent storage and AWS Compute Optimizer.

Intelligent storage

Amazon offers efficient and intelligent storage for object, file, and block-based applications. With AWS storage, you only pay for what your applications need, and storage capacity planning and over-provisioning are a thing of the past. AWS storage services scale up and down on-demand, helping to ensure that your business is always ready for the next opportunity.

Amazon Simple Storage Service (Amazon S3) is our industry-leading object storage with multiple storage classes for low-cost archiving. Amazon FSx and Amazon Elastic File System (Amazon EFS) are fully managed options for high-performance and low-cost file storage. Amazon EFS Intelligent-Tiering, a new Amazon EFS lifecycle management feature, automatically optimizes costs for shared file storage when data access patterns change, without operational overhead. The result: You never have to worry about unbounded data access charges again. Amazon Elastic Block Store (Amazon EBS) delivers millisecond latency and up to five nines of availability for mission-critical applications like SQL, Oracle, and SAP HANA. Amazon EBS Snapshots protect your data and save you up to 75 percent on snapshots storage costs. Amazon EBS offers a wide variety of volume types to support the most demanding applications and budgets.

AWS Compute Optimizer

One of the best ways to get more value from your infrastructure spend is to provision only what you need. Unfortunately, that's easier said than done, as over- and under-provisioning are common, costly problems for many organizations.

AWS Compute Optimizer makes it much easier to provision with precision. It uses machine learning to analyze your historical utilization metrics, then recommends optimal AWS resources for your applications to reduce costs and improve performance.

With AWS Compute Optimizer, you can lower costs by up to 25 percent and optimize performance with actionable recommendations that generate quickly.

Achieving the best price performance for Linux-based applications



Linux is often considered the most available, versatile, and reliable operating system for critical applications and is designed to support many use cases, including gaming, databases, and high performance computing (HPC). Ensuring you get the best price performance for Linux-based applications is key.

Amazon EC2 instances powered by **AWS Graviton processors** help you maximize the value of your Linux applications with extensive support for many Linux-based operating systems and applications. AWS Graviton2-based EC2 instances deliver up to 40 percent better price performance³ for a broad spectrum of applications. And AWS Graviton3 processors, our latest generation, provide up to 25 percent better compute performance⁴ while using up to 60 percent less energy for the same performance than comparable instances powered by other processors in Amazon EC2.

Ideal applications for AWS Graviton-based instances

1. **Containerized applications**, which can easily be moved to Graviton-based instances with Arm-based container images
2. **Compute-intensive applications**, such as gaming, video encoding, HPC, and machine learning
3. **Open-source databases**, such as MySQL, PostgreSQL, and MariaDB
4. **SaaS services** that want to optimize costs and enhance performance for their users
5. **In-house applications** built using modern programming languages that are independent of the processor architecture or can easily be moved to the Arm architecture

Achieving the best price performance for Linux-based applications (cont'd)



“ AWS Graviton3-based EC2 C7g instances...are suitable for even the most demanding, latency-sensitive applications while providing significant price performance benefits and expanding what is possible within Fortnite and any Unreal Engine-created experience.”

Mark Imbriaco, Senior Director of Engineering, Epic Games

“ We began using AWS Graviton2-based instances during our summer of major sports broadcasts including the Olympic Games Tokyo 2020. Graviton2 was used in our caching services for our front end Subscriber Management and the Media Asset Management platforms to reach 175M viewers with *7x better performance*...”

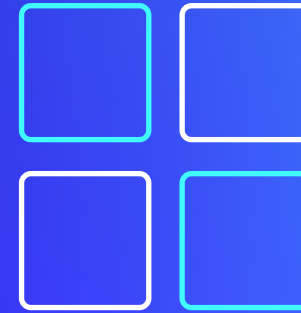
Damien Frost, Former SVP, Global Infrastructure Services, Discovery



“ With the superior performance and lower per-instance cost of Graviton2-based instances compared to x86-based instances, we are estimating *25% lower operating costs* for [DIRECTV STREAM] microservices...adoption was a seamless experience, and we are in the process of migrating our fleet of over 700 microservices to Graviton2-based instances.”

Jonathan Tronson, VP, Platform Engineering, DIRECTV STREAM

Achieving the best price performance for Windows-based applications



Organizations with mission-critical applications running on Microsoft technologies are often looking to innovate or modernize, scale applications globally, lower IT costs, and ensure security and compliance for underlying data.

According to IDC, organizations that moved their Windows applications to AWS achieved a 98 percent reduction in unplanned downtime, 71 percent faster deployment, and 26 percent higher developer productivity⁵—all great news for your bottom line. And a separate IDC report projected a 442 percent five-year ROI for organizations running Windows on AWS.⁶

Businesses choose AWS for their Windows-based applications—including Active Directory, .NET, Microsoft SQL Server, Windows desktop as a service, and all supported versions of Windows Server—because we offer the broadest and deepest set of capabilities, including higher performance and reliability, greater security and identity services, more migration support, lower total cost of ownership (TCO), and flexible licensing options.

We also provide the only fully managed services for native-Windows file systems with **Amazon FSx for Windows File Server** and for Kubernetes on Windows with **Amazon Elastic Kubernetes Service (Amazon EKS)**, enabling you to simplify management overhead and reduce costs.

“ Using Amazon FSx for Windows File Server allowed us to run a highly available SharePoint site, while at the same time *reduce our SQL license costs by more than 60%*. The feedback from our users is very positive, both in terms of performance and reliability of the system.”

Ivano Di Conca, Director of Cyber Security, CISO Avio Aero



⁵ Della Rosa, F., “Navigate Disruption and Drive Positive Business Outcomes with Cloud Migration.” IDC Doc. #US46658320, sponsored by AWS, July 2020

⁶ Della Rosa, F., Marden, M., “The Business Value of Efficiently Running High-Performing Windows Workloads in the AWS Cloud.” IDC Doc. #US45111619, sponsored by AWS, June 2019

Achieving the best price performance for Enterprise databases

(SAP / Microsoft SQL Server / Oracle)



Enterprise database applications are often responsible for large-scale, mission-critical business processes. Disruptions to these applications can be quite costly. But they also present significant business opportunity, as driving innovation and efficiency for these applications can lead to significant gains throughout the organization.

For SAP customers, AWS delivers more flexibility and value for your SAP investments with the world's most secure, reliable, and extensive cloud infrastructure, 200+ AWS services to help innovate, and purpose-built SAP automation tooling to keep personnel focused on value-adding activities.

Microsoft SQL Server and Oracle customers can take advantage of hourly pricing with no upfront fees or long-term commitments. With **Amazon Relational Database Service (Amazon RDS)**, you can make a low, one-time, upfront payment for each DB instance and then pay a significantly discounted hourly usage rate, achieving up to 65 percent net cost savings for Microsoft SQL Server and up to 48 percent for Oracle.

For customers who are seeking to migrate on-premises SAP, Microsoft SQL Server, and Oracle applications to a high-performance, highly available, low-latency cloud solution, Amazon offers Amazon Elastic Block Store (Amazon EBS) io2 Block Express. The combination of Amazon EC2 X2 or R5b instances and Amazon EBS io2 Block Express storage delivers millisecond-level latency and five nines of availability for mission-critical applications.

Achieving the best price performance for Enterprise databases (cont'd)



“ We have seen up to a **300 percent improvement in performance** for our [Oracle] Hyperion environment [since moving to AWS]...AWS is a strong collaborator that...helps us optimize our environment to keep costs down and continuously improve efficiencies.”

Gautam Tulsian, SVP & CIO, Global Finance, Equifax



“ We have increased the value of our SAP systems by integrating SAP with AWS technologies because ***we can steer the business in near real-time.***”

Yuriy Volosenko, Former Director for Enterprise Applications & Architectures, Zalando

Achieving the best price performance for Mac-based applications



For over a decade, Mac developers have been forced to live with the drawbacks, cost implications, and inflexibility of building and testing macOS applications outside of an on-demand cloud environment, as no cloud provider offered an on-demand Mac-based solution. Thankfully, that's no longer the case.

AWS made **Amazon EC2 Mac instances** generally available in 2020, becoming the first (and currently only) provider to extend the flexibility, scalability, and cost benefits of the cloud to Apple developers. Now your development teams can seamlessly provision and access macOS compute environments on demand to enjoy convenient, distributed testing and fast app builds.

Amazon EC2 Mac instances offload the heavy lifting that comes with managing infrastructure to AWS, so your developers can focus entirely on building creative and useful applications. Plus, they enable you to dynamically scale capacity as needed and benefit from AWS pay-as-you-go pricing.

“ Before [Amazon] EC2 Mac instances, physically procuring and managing our Mac build infrastructure was challenging, and our output was limited by the available physical machines. Now with Amazon EC2 Mac instances, we can scale our iOS build fleet, easily bake, roll back, and roll forward custom macOS environments with AMIs, and debug any build or test failures with fully reproducible macOS environments. Today, 100 percent of our production builds are running on Amazon EC2 Mac instances—*our builds are 18.4% faster and 80.5% more reliable*—and our iOS developers love it!”

Oliver Koo, Senior Software Engineer, Pinterest

Achieving the best price performance for Content delivery applications

(websites, API, live streaming)



Today's application developers need to provide a secure and low-latency user experience, all while trying to lower costs.

To make this happen, AWS has built Amazon CloudFront, a fast content delivery network (CDN) that supports website, video, API, and file caching. It enables you to reach global audiences in milliseconds by routing each user request to the edge location that can best serve your content. Amazon CloudFront also helps you lower costs by consolidating origin requests and by charging nothing for data sent from AWS Regions to our 410+ CDN edge networking locations.

Additionally, Amazon CloudFront edge locations help you secure access to your applications by offering distributed denial of service (DDoS) protection with AWS Shield at no added charge. If you wish to add additional support and monitoring, **AWS Shield Advanced** is available to deliver even greater security to your edge locations. With better threat detection and mitigation, near

real-time visibility into attacks, and simplified firewall integration, AWS Shield Advanced helps prevent costly security events along the more vulnerable edges of your network.

For added security, customers also have access to **AWS Web Application Firewall (AWS WAF)**. AWS WAF helps protect your web applications or APIs against common web exploits and bots that may affect availability, compromise security, or consume excessive resources.

Achieving the best price performance for Content delivery applications (cont'd)



“ By using Amazon CloudFront, we’ve calculated a **35% saving against our original running costs**. As of June 2021, we now deliver 250 million+ certified podcast downloads per month using Amazon CloudFront.”

Rocco Zanni, CTO, Spreaker



“ Our digital VOD services...reach around 1 million viewers daily and distribute more than 200 petabytes annually. Moving a majority of the traffic to Amazon CloudFront, our digital offerings decreased their operational costs by more than 50 percent. In particular, the cost-free exchange between Amazon S3 and Amazon CloudFront allowed **savings in the six-digit range per year**.”

Boris Radke, CIO, ProSiebenSat.1 Media SE

Get started

It's time to maximize the value of your infrastructure spend. With the broadest and deepest portfolio of infrastructure services, AWS offers many ways to help you stretch your budget further and accelerate innovation.

And since we enable the best performance at the lowest cost, you'll be able to build and run more apps on AWS within your budget than anywhere else.

It's time for you to get the best price performance for virtually any application in the cloud. Head over to our resource center to learn more about AWS—and discover how you can get started now.

[Learn more about how AWS can deliver more performance for your applications at optimal cost](#) ›

