



AWS INVESTMENT IN THE U.S.

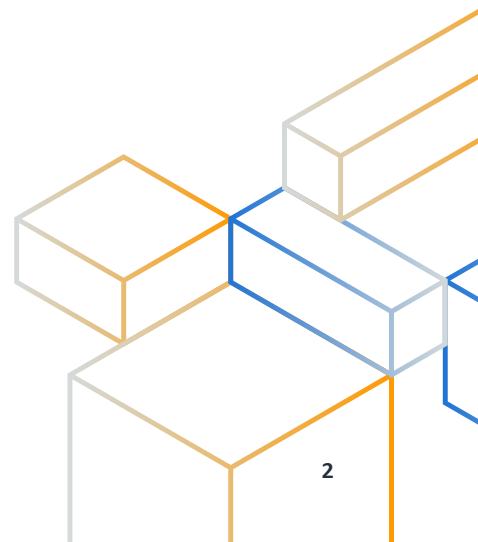
# AWS Economic Impact Study



AWS Economic Development | 2023

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# From Our CEO



When AWS launched in 2006, we embarked on a mission to democratize technology. We envisioned a world where any person with a computer, an internet connection, and an idea could access the same advanced technology as the world's largest enterprises or most well-funded research institutes. This new way of thinking gave birth to a never-before-seen technology we all now know as "cloud computing."

Today, AWS is the world's most comprehensive and broadly adopted cloud, offering more than 240 fully featured services from our global network of data centers. Our infrastructure delivers the most reliable, secure, and scalable computing technology to millions of customers, 24 hours a day. Since 2011, AWS has invested more than \$108 billion in the U.S. to develop and grow our cloud computing infrastructure. This investment alone has contributed nearly \$38 billion in gross domestic product (GDP) to the U.S. economy, as well as countless additional economic benefits that have come from empowering the fastest-growing startups, the largest enterprises, small and medium-sized businesses, government agencies, and nonprofits to innovate.

At AWS, we take a long-term view—we are building a business that will outlast us all. We bring this same long-term consideration to our investment choices. We think deeply about where we are investing as well as the impact it will have on the communities where we live and work.

One of Amazon's leadership principles is Success and Scale Bring Broad Responsibility, and we aim to live up to that principle. AWS is committed to being a responsible neighbor in every place we have a presence, and we spend a lot of time listening to and understanding the needs and priorities of all the communities in which we operate. We have dedicated resources to engage in what matters most to our neighbors, providing new educational opportunities at local schools, helping to develop the next generation of workforce, and always keeping sustainability and our net-zero carbon commitment to The Climate Pledge front of mind.

In this economic impact study, we present an overview of these activities, highlighting the positive effect AWS has on the communities where we operate across the U.S., how we contribute to the communities in which our employees and their families live, as well as the economic impact, prosperity, and jobs that are supported from our investments.

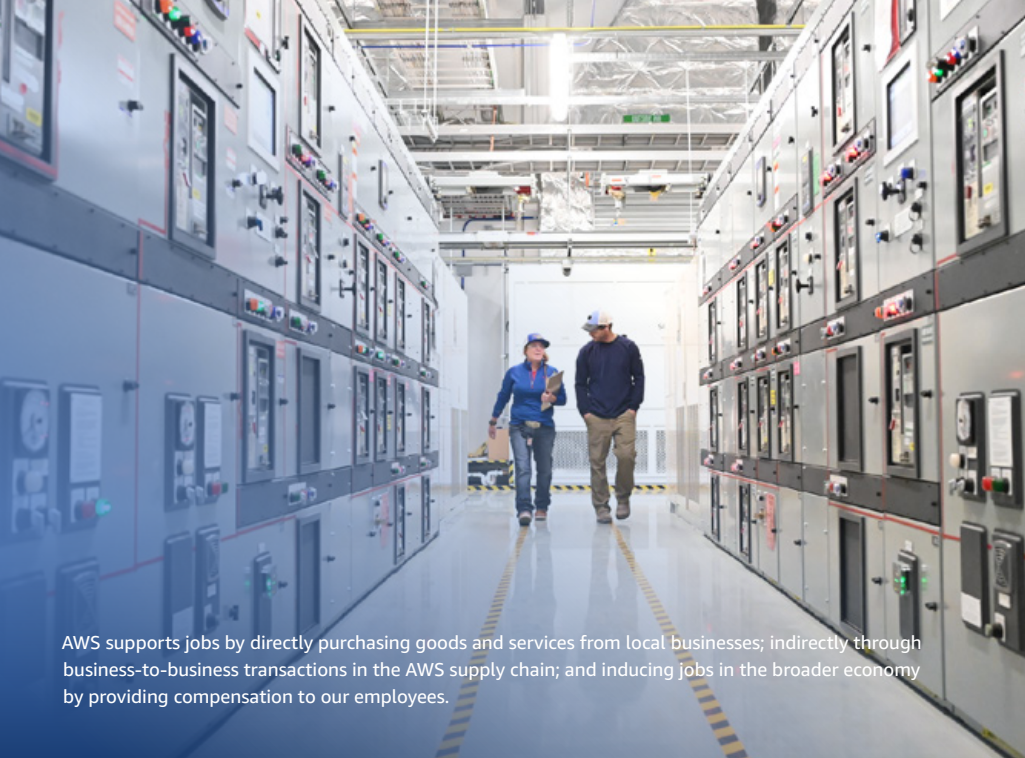
We remain steadfast in our commitments to our customers, to our communities, and to the planet, and as we continue to grow and invest in these communities, we will strive to build a better future together.

**Adam Selipsky**

CEO at Amazon Web Services (AWS)







AWS supports jobs by directly purchasing goods and services from local businesses; indirectly through business-to-business transactions in the AWS supply chain; and inducing jobs in the broader economy by providing compensation to our employees.



# Economic Impact of AWS Infrastructure in the United States

When Amazon Web Services (AWS) invests in communities around the globe, it creates trackable and demonstrable economic growth in those areas. This AWS economic impact study (EIS) describes the impact generated by AWS's infrastructure investment in the United States from 2011–2022. This study outlines the ripple effects of that investment across the country. AWS investment in the U.S. enables job retention, cloud training and education, community engagement, and long-term financial stability for individuals, and it provides customers of all sizes and across all industries world-class technology to revolutionize the way they operate and innovate.



**\$108.96  
billion**

Total investment by AWS into its cloud computing infrastructure in the U.S.



**\$37.69  
billion**

Estimated gross domestic product (GDP) contributed to the U.S. by AWS investment



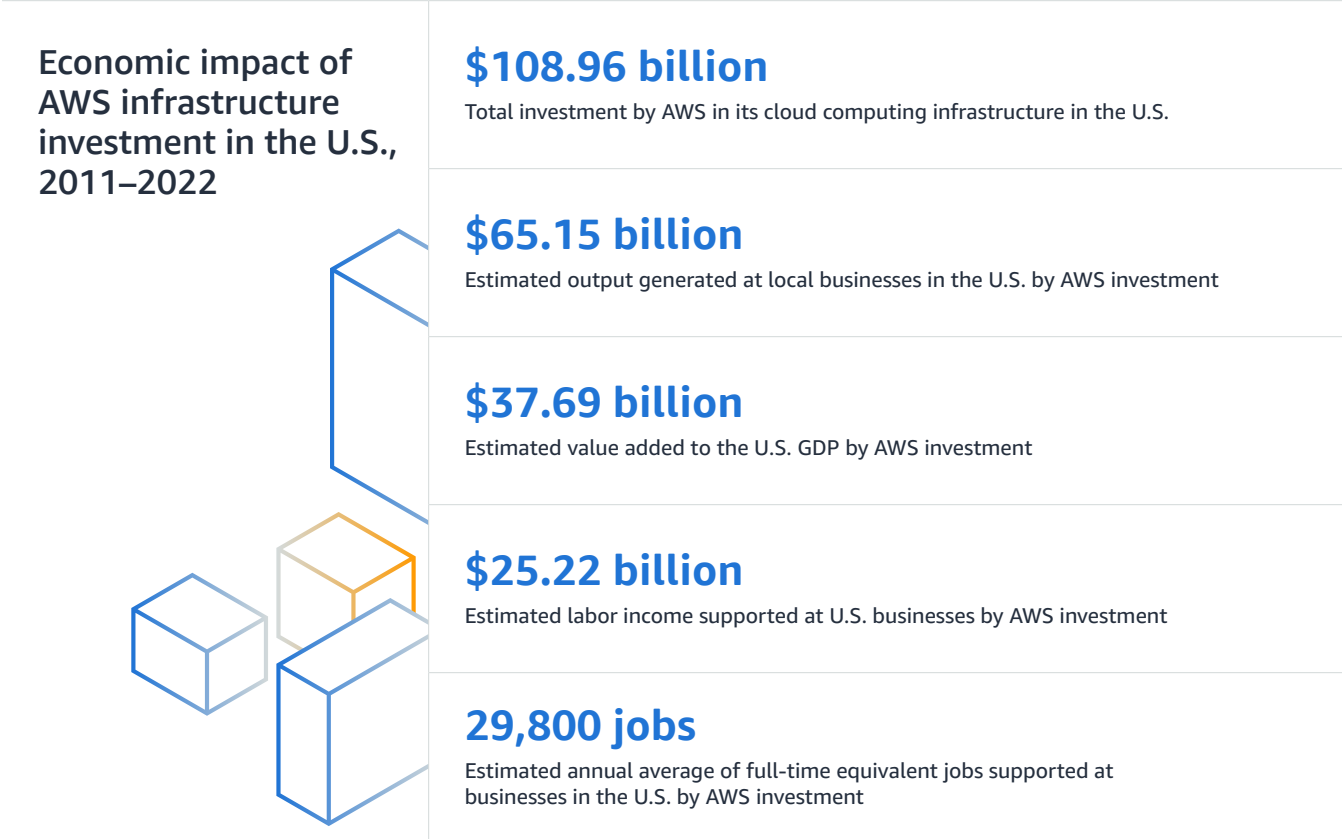
**29,800  
jobs**

Estimated annual average of full-time equivalent jobs supported at local businesses in the U.S.



For more than 16 years, AWS has been delivering cloud services to millions of customers running a wide variety of use cases. To deliver this unmatched experience, maturity, reliability, security, and performance, AWS has invested in its cloud infrastructure across the nation. When AWS constructs, connects, maintains, and operates AWS data centers, it invests in communities. This investment is felt through job creation and retention, renewable energy projects, access to cloud training and education, community engagement, and long-term financial stability for individuals.

In this study, we prepared a conservative estimate of the value added to the U.S. GDP by AWS investment that evaluates only the economic impact of the portion of that investment that is spent locally. AWS investment includes capital expenditures (capex) on construction labor, materials, services, manufacturing, and supply chain operations, as well as recurring operating expenditures (opex) on employee and contractor compensation, utility fees, and facilities and rental costs. It excludes all imports, including local spending from supply chain and assembly for these exports.



From 2011 to 2022, AWS purchased an estimated **\$35.42 billion in goods and services from U.S. suppliers** to support its data centers. **Every \$1 of this local spending generated an additional \$0.84 in output for U.S. businesses.** Our spend in the U.S. created an estimated total output of \$65.15 billion for local businesses.



## Economic impact of AWS data center construction

AWS purchases construction labor, materials, and services from U.S. supply chains to support the expansion of new and established data centers. From 2011 to 2022, **AWS local spending on data center construction in the U.S. totaled \$18.30 billion**. The economic impact of this local spending supports jobs in the skilled trades, such as electricians, fiber-optic technicians, and heating, ventilation, and air conditioning (HVAC) technicians.

Economic impact of AWS data center construction, 2011–2022



**\$92.04 billion**

Total investment by AWS in the construction of its cloud computing infrastructure in the U.S.

**\$38.55 billion**

Estimated output generated at local businesses in the U.S. by AWS data center construction

**\$21.44 billion**

Estimated value added to the U.S. GDP by AWS data center construction

**\$16.24 billion**

Estimated labor income supported at businesses in the U.S. by AWS data center construction

**19,900 jobs**

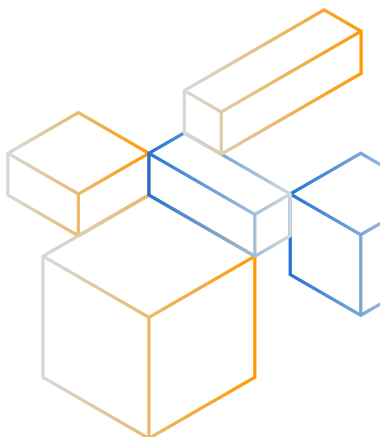
Estimated annual average of full-time equivalent jobs supported at businesses in the U.S. by AWS data center construction



## Economic impact of AWS data center operations

AWS purchases of utilities, leases of real estate and networking infrastructure, and compensation paid to related AWS employees and contractors support the continuous operation of data centers. From 2011 to 2022, **AWS local spending on data center operations in the U.S. totaled \$17.01 billion**. The economic impact of this local spending supports jobs such as data center technicians and utility tradespersons as well as in building maintenance, equipment repair, and security.

### Economic impact of AWS data center operations, 2011–2022



**\$17.01 billion**

Total investment by AWS in the operations of its cloud computing infrastructure in the U.S.

**\$26.14 billion**

Estimated output generated at local businesses in the U.S. by AWS data center operations

**\$15.97 billion**

Estimated value added to the U.S. GDP by AWS investment in its data center operations

**\$8.75 billion**

Estimated labor income supported at businesses in the U.S. by AWS data center operations

**9,700 jobs**

Estimated annual average of full-time equivalent jobs supported at businesses in the U.S. by AWS data center operations





## Economic impact of AWS manufacturing and supply chain operations

AWS purchases related to manufacturing and supply chain operations to refurbish, repair, and reuse data center equipment in the U.S. support Amazon's path to reaching net-zero carbon emissions by 2040, as part of [The Climate Pledge](#). From 2011 to 2022, **AWS local spending on manufacturing and supply chain operations in the U.S. totaled \$110 million**. The economic impact of this local spending supports job roles such as engineering technicians, logistics specialists, and warehousing and delivery associates, as well as job opportunities in security.

### Economic impact of AWS manufacturing and supply chain operations, 2011–2022



**\$3.28 billion**

Total investment by AWS in manufacturing of its cloud computing infrastructure in the U.S.

**\$460 million**

Estimated output generated at local businesses in the U.S. by AWS local spending on data center operations and compensation

**\$270 million**

Estimated value added to the U.S. GDP by AWS investment in its data center supply chain

**\$230 million**

Estimated labor income supported at businesses in the U.S. by AWS investment in its data center supply chain

**200 jobs**

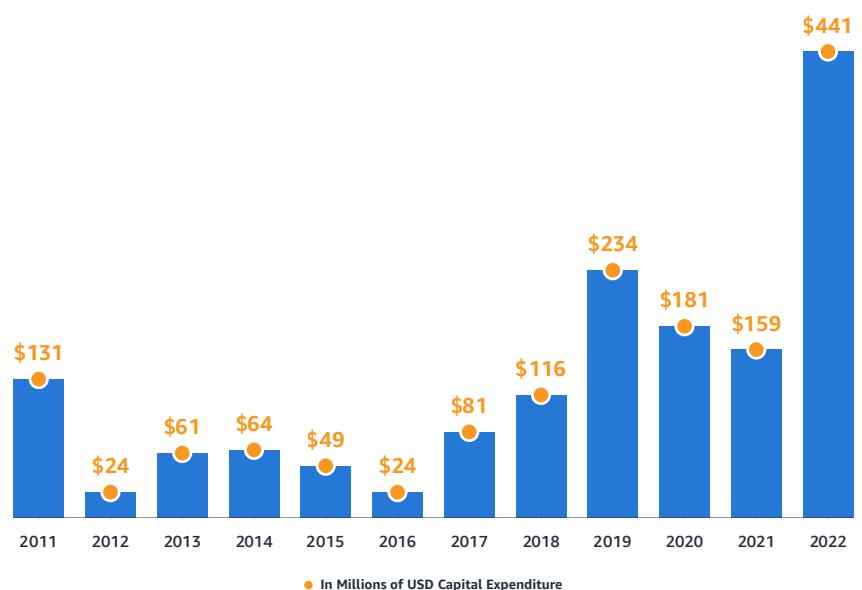
Estimated annual average of full-time equivalent jobs supported at local businesses in the U.S. by AWS investment in its data center supply chain



## AWS infrastructure investment across the U.S., 2011–2022

According to Brookings,<sup>1</sup> “the [Organization for Economic Co-operation and Development \(OECD\)](#) finds that the average income gap between the most and least productive regions within wealthy nations grew an astonishing 60% over the past two decades.” However, the income gaps among wealthy nations have long been recognized as a challenge that needs to be addressed by the private sector, as well. When corporations like AWS choose to invest in infrastructure, companies introduce transformative factors to the financial outlook of the communities that host and neighbor them. In 2020, for example, AWS invested \$181 million in Fairfax County, nearly 24% of the Alexandria, Virginia, annual budget of \$761.5 million that year. Of note, Alexandria is the largest city in Fairfax County.

### AWS Capital Investment in Fairfax County, Virginia



<sup>1</sup> <https://www.brookings.edu/articles/making-local-economies-prosperous-and-resilient-the-case-for-a-modern-economic-development-administration/>

AWS has established infrastructure in four major geographic locations in the United States—California, Ohio, Oregon, and Virginia—and has purchased goods and services from nearly all 50 states. This economic activity is best understood in terms of the revenue AWS has helped to create across the nation, which funnels into tax revenue, fosters innovation, and sustains small and medium-sized businesses and local shops. Our workforce development trainings are administered with, and by, more than 500 community colleges and universities around the country, not just for future AWS employees, but for a broad, empowered adult workforce. The community of construction workers generates induced effects such that the workers may go into local restaurants and shops, or provide a steady babysitting income for the local population.

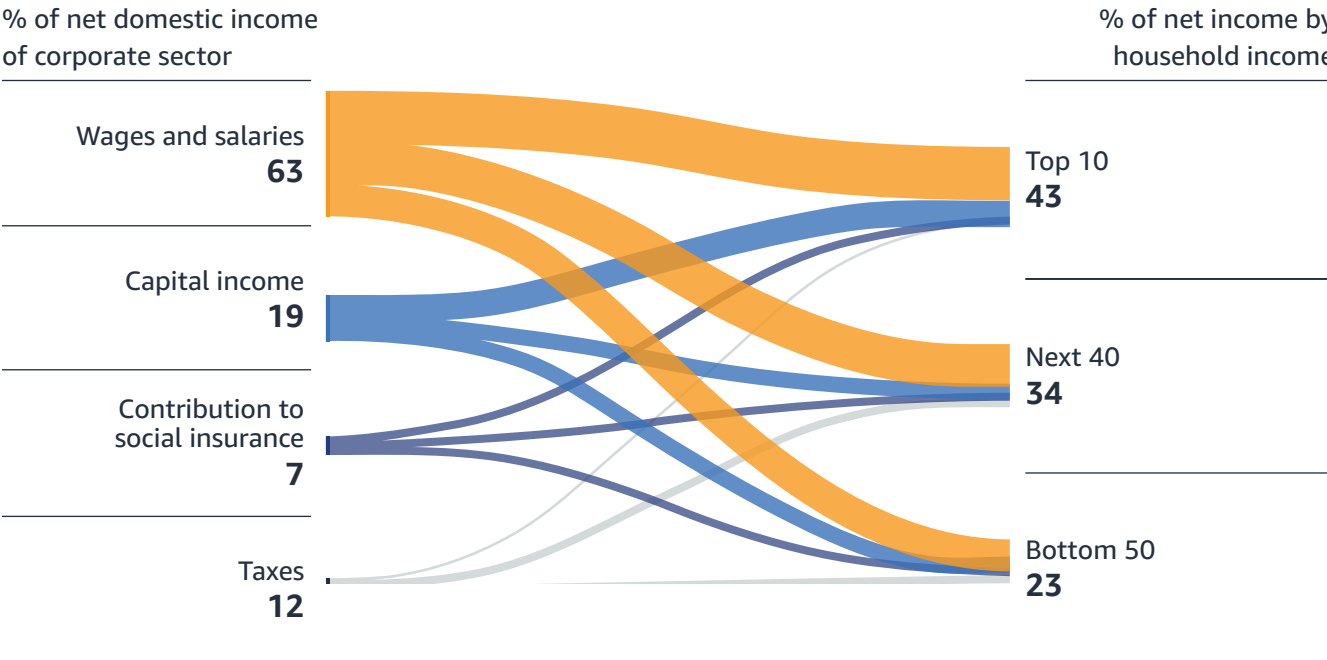
AWS infrastructure investment across the U.S. creates measurable economic impacts on communities via local spending on the construction, connection, maintenance, and operation of AWS data centers. This includes supporting the creation and retention of jobs that contribute money to local economies. AWS infrastructure in the U.S. includes groups of data centers that make up AWS Regions and the associated **Availability Zones** in a geographic area; **AWS GovCloud (US)**, which helps government customers address compliance; **AWS Local Zones**, which bring AWS capabilities closer to end users; and **Amazon CloudFront** locations, which are content delivery networks. For a full description of AWS investment, types of infrastructure, jobs supported, and more, refer to the **Glossary** on [page 28](#).

The visual below<sup>2</sup> shows how just one of the metrics outlined in this report—labor income—flows into household income, generating tangible wealth for individuals and families. Other metrics in this study, like added value to GDP, similarly illustrate the size of the economic activity that has to take place to realize the investment. However, economic impact metrics do not measure individuals’ well-being or lifestyle improvements. The second part of this report focuses on AWS’s community engagements in our four major geographic areas, to paint a picture of how our infrastructure investment affects local communities and individuals.

**Labor income, capital income, and taxes flow to different household segments.**

**Capital value flows to household**

**United States**



Source: McKinsey Global Institute analysis

<sup>2</sup> <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/a-new-look-at-how-corporations-impact-the-economy-and-households>



# Economic impact of AWS investment the U.S., 2011–2022

Investment in these communities includes the construction of data centers, connection of fiber-optic networks, operation of cloud computing, and building and equipment maintenance that enables delivery of cloud services to millions worldwide.



U.S. West  
(Northern California)  
Region

**\$4.2**

billion investment

**\$2.11**

billion GDP

**1,500**

jobs supported

U.S. East  
(Ohio)  
Region

**\$6.3**

billion investment

**\$2.23**

billion GDP

**3,550**

jobs supported

U.S. West  
(Oregon)  
Region

**\$22.9**

billion investment

**\$6.4**

billion GDP

**5,700**

jobs supported

U.S. East  
(Northern Virginia)  
Region

**\$63.9**

billion investment

**\$21.3**

billion GDP

**16,600**

jobs supported

GovCloud, Cloudfront, Local Zones, and other infrastructure and related operations

**\$8.23**

billion investment

**\$5.38**

billion GDP

**4,200**

jobs supported

Manufacturing Operations

**\$3.28**

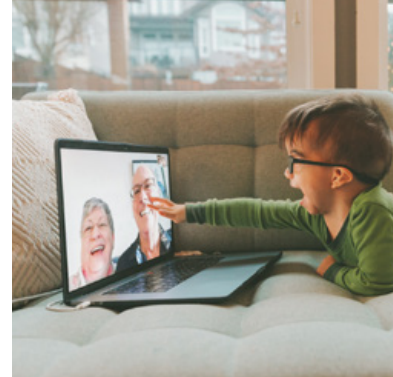
billion investment

**\$0.27**

billion GDP

**200**

jobs supported



# What is cloud computing?

Cloud computing is the on-demand delivery of IT resources over the internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data centers and servers, customers can access technology services, such as computing power, storage, and databases, on an as-needed basis from AWS



## What are the advantages of cloud computing?

- **Agility:** AWS lets customers quickly spin up resources as they need them, deploying hundreds or even thousands of servers in minutes, leading to faster innovation.
- **Cost savings:** AWS's pay-as-you-go pricing means that the customer only pays for the resources used instead of the traditional IT model, where expenses are a fixed cost.
- **Elasticity:** Customers do not have to over-provision resources upfront. Instead, they provision only the resources they need to scale up or down with the needs of their businesses, which reduces costs and improves the ability to meet their users' demands.
- **Innovation:** Customers can innovate faster because they can focus IT resources on developing applications to transform customer experiences instead of managing infrastructure.
- **Scalability:** AWS has the most extensive, reliable, and secure global cloud infrastructure, enabling customers to deploy globally in minutes.
- **Security:** AWS is architected to be the most flexible and secure cloud computing environment available today. Customers can build on the most secure global infrastructure, knowing they always control their data, including the ability to encrypt it, move it, and manage retention at any time.

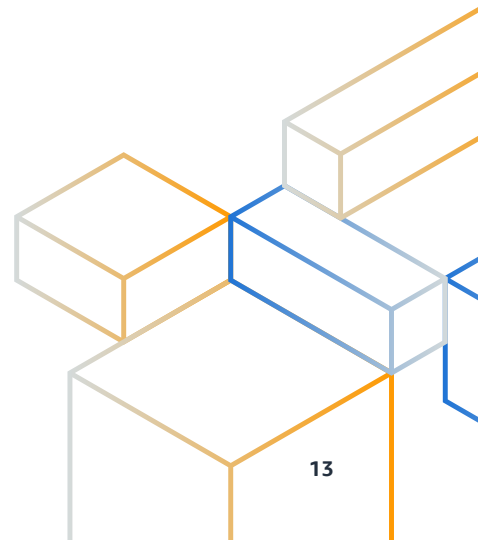




## What is AWS?

AWS is the world's most comprehensive and broadly adopted cloud, offering more than 240 fully featured services from data centers globally. Millions of customers—including the fastest-growing startups, largest enterprises, and leading government agencies—use AWS to lower costs, become more agile, and innovate faster.

AWS offers the most proven operational expertise of any cloud service provider, including the most functionality, the most flexible and secure cloud computing environment, the fastest pace of innovation, and the largest community of customers and partners, including millions of active customers and more than 100,000 AWS Partners from more than 150 countries.





# Who benefits from AWS?

AWS provides advanced technologies to businesses, helping to revolutionize the way they operate and innovate. It's how **Toyota North America reinvented the development** of connected vehicles while reducing costs up to 80%, how **NBC Universal livestreamed Super Bowl LVI** to 6 million concurrent viewers on Peacock, and how **Johnson & Johnson archived** more than 5 petabytes of data to meet compliance requirements while saving \$1 million annually. AWS supports individuals who launch their own businesses, like the **Xocolatl Bakery** in Oregon, and through our Workforce Development and Training program, AWS partners with community colleges to **provide scholarships to students** through the Data Center Technician and the AWS AI & ML Scholarship program. AWS is committed to providing education and skill-building to people globally by offering **more than 600 free cloud computing courses**. Recognizing the critical importance of global environmental issues, AWS has been instrumental in **finding solutions to the world's water crisis**.



# \$382 billion

Cloud services generated over \$382 billion in Gross Value Added for U.S. businesses in 2021.<sup>3</sup>

Millions of customers—ranging from startups to large enterprises and public sector organizations—use AWS to lower costs, increase agility, and solve important problems.



In entertainment, **Netflix**, and **Disney+** leverage the flexible, secure cloud infrastructure of AWS to deliver high performance, personalized video to millions of people.



In healthcare, companies such as **Lyell**, **Pfizer**, and **Moderna** are using AWS capabilities to revolutionize healthcare, developing new classes of cancer treatments, vaccines, and medicines.



In education, industry leaders like **Blackboard**, **Clever**, and **PBS** use AWS to reshape and personalize education, enabling virtual classrooms and providing digital learning resources to students.



In aerospace, organizations such as **NASA's Jet Propulsion Laboratory**, **Capella Space**, and **Descartes Labs** are turning to AWS to access and process data at unprecedented rates of speed to solve global problems and understand mission and safety information.



In agriculture, companies like **AGCO Corporation**, **John Deere**, and **Carrier Global** use AWS to improve crops, reduce food spoilage, and reduce costs.



In energy, companies like **GE Renewable Energy**, **Duke Energy**, and **bpx energy** are harnessing AWS to accelerate their clean energy goals and work toward net-zero carbon emissions.



In the public sector, organizations including the **National Oceanic and Atmospheric Administration (NOAA)** and the **U.S. Census**, are using AWS to digitally transform their work.



In transportation, **Delta Air Lines** and **Southwest** are modernizing their technological frameworks on AWS, and automakers like **Ford** and **Rivian** use AWS to develop more personalized and safer driving experiences.

<sup>3</sup> According to Public First study, "The Impact of Cloud Services in the United States" <https://cloudimpactx.publicfirst.com/>



“

There are so many opportunities for you in AWS data centers. I started out with an engineering degree unrelated to computer science, and I found my way over to this IT side. I've fallen in love with IT. What I tell other folks like me is just try it, take a stab at working in a data center, and who knows? Maybe you will fall in love with it like I did.”

Akwasi “Marty” Abankroh  
Data Center Ops Technician  
U.S. East (Northern Virginia) Region

# AWS Global Infrastructure



**32**

Global  
Regions



**102**

Availability  
Zones



**550+**

Points of  
Presence



**34**

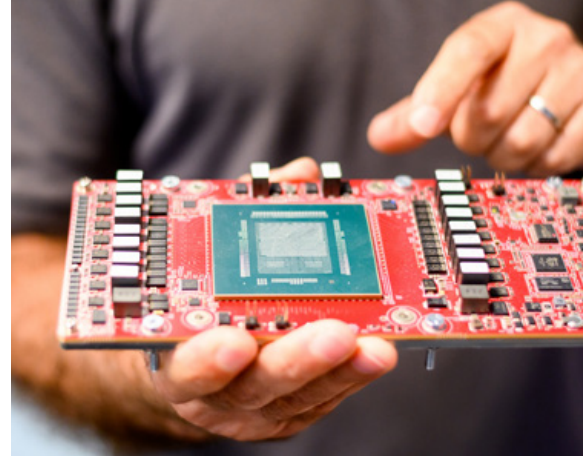
AWS Local  
Zones

AWS launched its first set of data centers, which constitute the AWS US East (N. Virginia) Region, in 2006, giving enterprises, public sector organizations, startups, small and medium-sized enterprises (SMEs), individual developers, and students access to state-of-the-art cloud infrastructure. AWS's presence gives organizations the ability to deploy globally in minutes, bringing enhanced customer experiences to their end users around the world. AWS provides customers with the level of capacity when they need it, and where they need it, which is enabled by our global infrastructure. When organizations experience unprecedented demand, the scale and elasticity of AWS helps keep them running.

Recognizing the growing demand and workload requirements of its customers, AWS further expanded its infrastructure presence in the U.S. Today, in the U.S., AWS has **four commercial Regions**, along with two **AWS GovCloud (US) Regions** specifically designed for public sector customers. In addition, with more than **170 Amazon CloudFront locations** and nearly **20 AWS Local Zones** across the U.S., AWS ensures that its customers have the necessary resources to grow their businesses, lower costs, innovate faster, scale efficiently, connect securely, and increase resiliency. To learn more about our infrastructure, refer to the Glossary on [page 28](#).



# Innovation and Industry Leadership



Customers continue to choose AWS over other providers because we provide the most functionality, the largest community of customers and partners, the most proven operational and security expertise, and the fastest pace of innovation. AWS has the broadest and deepest portfolio of artificial intelligence (AI) and machine learning (ML) services, and these technologies have been a focus for Amazon for more than 20 years. AWS announced a \$100 million investment in a new AWS Generative AI Innovation Center,<sup>4</sup> which will connect AWS AI and ML experts with customers around the world to help them envision, design, and launch new generative AI products, services, and processes.

AWS has more than 240 fully featured services to support virtually any cloud workload, offering services for compute, storage, databases, networking, analytics, ML, AI, Internet of Things (IoT), mobile, security, hybrid, virtual and augmented reality (VR and AR), media, and application development, deployment, and management.

AWS has its own family of custom chips, designed and built by the Annapurna Labs team; many of the employees are based in Austin, Texas. The team develops all silicon chips in-house to deliver products more quickly, including custom “system on a chip” for machine learning acceleration. AWS also offers a range of Graviton processors for a wide range of workloads, including Graviton3—the latest iteration—which offers 25% higher compute performance than its predecessors. Graviton3-based virtual servers running in Amazon Elastic Compute Cloud (Amazon EC2) use up to 60% less energy for the same performance than comparable EC2 instances, helping customers reduce their carbon footprint.

AWS is architected to be the most flexible and secure cloud computing environment available today. Our core infrastructure is built to meet the rigorous security requirements of the military, global banks, and other high-sensitivity-oriented organizations. AWS supports 143 security standards and compliance certifications, helping our customers meet regulatory requirements across the globe.

<sup>4</sup> <https://press.aboutamazon.com/2023/6/aws-announces-generative-ai-innovation-center>



**\$100 million**

Investment in a new AWS Generative AI Innovation Center

**600+**

Amazon Elastic Compute Cloud (Amazon EC2) offers more than 600 instance types, the most extensive selection among all cloud providers

**900,000+**

AWS Database Migration Services have been used to migrate more than 900,000 databases

**250+**

Amazon SageMaker includes more than 250 added capabilities, which, since its launch in 2017, provides developers with the ability to create, train, and deploy machine learning models

# 3,332

The number of new significant services and features launched by AWS in 2022—a substantial increase from the 80 services and features released in 2011

# 129

The number of times AWS has lowered its prices since its launch in 2006, demonstrating our commitment to delivering value to customers

# 143

AWS offers 143 security standards and compliance certifications

“

**The innovation, security, simplicity, and reliability of AWS machine-learning and generative AI services help us accelerate our data capabilities to deliver transformational innovation and results to our customers.”**

Jonathan Nelson  
CEO  
Omnicom Digital

AWS's Generative AI Innovation Center is a team of strategists, data scientists, engineers, and solutions architects who work step-by-step with customers to build solutions that harness the power of generative AI. The center will leverage the \$100 million investment and AWS's years of experience in accelerating AI work with customers to develop new capabilities focused on generative AI. Through no-cost workshops, engagements, and training, AWS is working with hundreds of customers such as Duke Energy, Highspot, Lonely Planet, Ryanair, Twilio, and others to imagine and scope the use cases that will create the greatest value for their businesses. The team is distributed to help customers around the world, with many based in the San Francisco Bay Area, near the AWS US West (N. California) Region.





# Workforce Development and Training

As part of Amazon's commitment to empowering communities, we are investing hundreds of millions of dollars to help 29 million people around the world grow their tech skills by 2025. Through AWS-designed programs, we've already provided free cloud skills training to 13 million individuals since 2020.

Through [AWS Academy](#), we collaborate with local education institutions, including community colleges, historically Black colleges and universities, minority-serving institutions, and four-year colleges, to provide cloud computing and technical trade training to students and communities.

To support underserved and underrepresented students, we also fund scholarships, including the [AWS AI & ML Scholarship](#), which is helping high school and college students learn foundational ML concepts to prepare them for AI and ML careers. Additionally, the Data Center Technician program, created in partnership with community colleges, including Blue Mountain Community College in Oregon, Columbus State Community College in Ohio, and Northern Virginia Community College, offers scholarships to students.

## 98%

Percentage of learners who have connected to job interview opportunities globally through the AWS re/Start program

## 500+

Number of colleges and universities in the U.S. that offer AWS Academy courses

## 200

Number of countries and territories in which AWS provides training

## 600+

Number of free cloud computing skills training courses available on AWS Skill Builder

## 70+

Number of AI and ML courses and learning resources offered through AWS Skill Builder and AWS Educate



## Our programs include:



**AWS Educate:** AWS offers hundreds of hours of free, self-paced training and resources for new-to-cloud learners, including hands-on labs in the AWS Management Console.



**AWS Fiber Optic Fusion Splicing Certificate Program:** A free, two-day training course on fiber-optic installation and repair, hosted in collaboration with local community colleges and workforce development organizations.



**AWS Grow Our Own Talent:** A paid, on-the-job training and job placement program in AWS data centers for Amazon employees and entry-level candidates with nontraditional backgrounds.



**AWS re/Start:** A free, cohort-based, multiweek workforce development training program that prepares unemployed and under-employed individuals for entry to mid-level cloud careers.



**AWS Skill Builder:** A free online learning center offering more than 600 digital courses for learners at all skill levels in more than 200 countries to build their knowledge across AWS services, including preparing for industry-recognized AWS Certification exams.



**Amazon Technical Apprenticeship:** A paid, intensive classroom training program, inclusive of apprenticeships at Amazon and AWS, certified by the U.S. Department of Labor.

# 29 million

The number of people Amazon has committed to provide free training on cloud computing and to help develop technical skills by 2025

# 1 million+

The number of active AWS Certifications, which has grown by more than 29% in the past year


# 13

The age at which new-to-cloud learners can begin taking advantage of hundreds of the extensive resources and self-paced online training resources and labs available on AWS Educate

“

**AWS has been a leader in growing technology and innovation in Ohio and has been instrumental in developing the path for a strong workforce through a variety of programs and educational opportunities. The impact their work has had here with local schools and organizations has been tremendous. We are grateful for their commitment and dedication to the places they call home.”**

**J.P. Nauseef**  
President and CEO  
JobsOhio



To help build a vibrant pool of talent, AWS invests in developing local talent in communities across the U.S. For instance, near the US East (Ohio) Region, several colleges and universities, including Columbus State Community College, Miami University, and the University of Cincinnati, offer AWS Academy courses. In March 2023, AWS collaborated with Ohio's Office of Workforce Transformation (OWT), local employers, and educational organizations to host the first Fiber Broadband Awareness week. As part of the event, AWS conducted its free, two-day Fiber Optic Fusion Splicing certificate course at the Tolles Career & Technical Center in Plain City and the PAST Foundation in Columbus, Ohio.





# Sustainability

Amazon is committed to reaching net-zero carbon emissions by 2040 as part of [The Climate Pledge](#)—10 years ahead of the Paris Agreement. As part of The Climate Pledge, Amazon is on a path to power its operations with 100% renewable energy by 2025, five years ahead of the initial 2030 target.

- **Renewable Energy**  
In 2022, 90% of the electricity consumed by Amazon was attributable to renewable energy sources. As of January this year, Amazon has announced more than 400 renewable energy projects around the world representing more than 20 gigawatts (GW) of renewable energy capacity.
- **Energy Efficiency**  
AWS focuses on efficiency and waste reduction throughout all aspects of its infrastructure. AWS's scale allows for the ability to achieve higher resource usage and energy efficiency than the typical on-premises data center.
- **Water Stewardship**  
AWS is making progress toward meeting its commitment to be water positive by 2030, returning more water to communities than it uses in its data center operations.
- **Carbon Reduction**  
Moving to AWS offers carbon reduction opportunities for customers. Multiple studies conducted by 451 Research, part of S&P Global Intelligence, found that moving on-premises workloads to AWS can lower the workload carbon footprint by nearly 80% and up to 96% once AWS is powered with 100% renewable energy, by 2025.

## 200

Amazon has announced 200 renewable energy projects in the U.S.

## 90%

In 2022, 90% of the electricity consumed by Amazon was attributable to renewable energy sources

## 3.6x

AWS infrastructure is 3.6 times more energy efficient than the median U.S. enterprise data center

## 96%

Amazon has sent 96% of cooling water from the US West (Oregon) Region directly to farmers to irrigate crops

## 20%

The percentage of reduction in embodied carbon compared to standard concrete in new U.S. data centers



# 100%

In 2022, electricity consumed in 19 AWS Regions globally, including every AWS Region in the U.S., was attributed to 100% renewable energy

# 0.19

AWS uses 0.19 liters of water per kilowatt-hour, the lowest among cloud providers

# 20

AWS data centers worldwide that use recycled water, 18 of which are in the U.S.

“

**Amazon’s clean energy portfolio doesn’t just top the corporate charts—it is now among the leading utilities globally, as well. The fact that it announced a new annual record of clean energy in a year mired by a global energy crisis, supply chain bottlenecks, and high interest rates speaks to its forward planning and expertise in navigating power markets and executing long-term contracts.”**

**Kyle Harrison**

Head of Sustainability Research  
Bloomberg New Energy Finance

Amazon has 200 renewable energy projects across the United States, and in Virginia, 18 solar farms help support the US East (N. Virginia) Region. Once fully operational, these solar farms will provide enough energy to power 276,000 U.S. homes. AWS also collaborated with a local high school for students to visit Amazon’s solar farm in Fort Powhatan, Virginia, to inspire careers in climate and sustainability.







# Community Impact

Recognizing that every community is unique, we focus on creating programs that are tailored to each community and work in collaboration with local organizations. To make a positive impact in the communities where we build and operate our global infrastructure, we established a program called **AWS InCommunities**. We listen, invest, and innovate quickly to help build healthier, stronger, and more vibrant communities. We do this through science, technology, engineering, arts, and mathematics (STEAM) education, equity, and access; local tech upskilling; environmental stewardship; and employee engagement. Examples of our programs include:

- **Girls' Tech Day**—This program aims to educate, inspire, and empower girls and women, from elementary school through college, to pursue careers in technology, encouraging future female builders through fun and engaging workshops.
- **Think Big Spaces**—These specialized classroom-type spaces, situated in local schools or community centers, offer students a place beyond the standard classroom for students to explore and cultivate an interest in STEAM and STEAM-related careers. These labs provide a hands-on method of instruction where students can think big and solve real-world problems.

Beyond STEAM programs, AWS supports hundreds of charitable organizations that strengthen the communities where our employees and customers live and work. We also encourage employee engagement in our community programs. Last year, AWS employees contributed more than 27,300 hours of volunteer services in our data center locations globally.

## 50,000

Number of students who have access to STEAM education through AWS Think Big Spaces in the U.S.

## 25

Number of AWS Think Big Spaces in the U.S., enabling access to STEAM education for students; globally, there are more than 60 Think Big Spaces

## 12

Number of Girls' Tech Day events that took place in 2022, reaching more than 13,000 girls and young women in communities worldwide

## 27,300+

Number of hours in volunteer services contributed by AWS data center community employees globally in 2022



# 4.3 million

Financial support from AWS to foodbanks in U.S. communities funded approximately 4.3 million meals for food insecure individuals in 2022

# 150+

Number of projects funded in the U.S. to date through the AWS InCommunities Fund microgrant program

# 1,761,573

Number of positive community interactions—defined as an engagement with a community member that results in a benefit for the recipient—by AWS InCommunities in the U.S. in 2022. Globally, the team had more than 3 million of these interactions in 2022.

“

AWS has had a huge impact in creating so many more jobs in the area. The company's investments around here have also improved our education system. Now we have programs for our kids during the summer. For the first time next year, our local high school will be offering a robotics class.”

Alma Nuñez Lezama  
Owner of Xocolatl Bakery  
(Boardman, Oregon)

AWS InCommunities is obsessed with being good neighbors, and we start with the community and work backwards to represent infrastructure communities inside AWS. Near our US West (Oregon) Region, we have made it a priority to support local schools, community-based organizations, and businesses. In 2022, in eastern Oregon, AWS InCommunities donated \$2 million to organizations and supported more than 50 microgrant programs.







“

Events like Girls' Tech Day are important because they reinforce the message that we want, and need, more women to be part of these fields. It's critical that we keep developing and encouraging their talent, so they can seize the opportunities available to them in tech.”

Stephanie Kunze  
Ohio State Senator

# Economic Impact Study

## Methodology

To measure the economic impact of data center investments, AWS uses a Nobel Prize–winning model developed by Harvard economist Wassily Leontief: the input-output (I-O) model. The institutions that use this model include G20 governments and most blue-chip businesses.<sup>5</sup> In processing the model, AWS uses a conservative framework to define investment and calculate economic multipliers, which represents the “as built” world. AWS Economic Impact Studies can be directly correlated with what it took, or what AWS is actively planning to do, to construct, connect, operate, and maintain the data centers in a given Region.

I-O models are used to measure the impact of the expansion or contraction of one economic activity on other economic activities, and on the local economy as a whole. In the I-O model, “local” is typically a country, but could also be a smaller geographic area, e.g., a county in the U.S., a region in the EU (e.g., Lombardy in Italy), or a state in Australia (e.g., Victoria). This method uses historical country data maintained by the country’s government statistical agency or the OECD.

Input-output tables show the impact of each unit of currency spent in one industry on all other industries. For example, one U.S. dollar spent on construction might typically be associated with 20 cents spent on electricity and other utilities.

AWS also uses Amazon company data on AWS operations and investments tied to constructing and operating data centers. The methodology uses standard procedures for calculating multipliers from the input-output data published by the OECD. See, for example, Ronald Miller and Peter Blair, “[Input-Output Analysis: Foundations and Extensions](#),” 2009, Cambridge University Press. The estimated economic impacts are the cumulative effects of:

- **Direct effect**, which is the change in employment, earnings, and GDP created by AWS’s direct suppliers in a country as a result of the AWS investment, such as construction firms, colocation providers, or power companies.
- **Indirect effect**, which is the change in employment, earnings, and GDP created by the indirect suppliers, which supply to AWS’s direct suppliers as a result of the AWS investment, such as construction labor and materials.
- **Induced effect**, which is the change in employment, earnings, and GDP created by the firms that supply household goods to workers at Amazon companies and AWS’s direct and indirect suppliers.

<sup>5</sup> A [blue chip](#) is a nationally recognized, well-established, and financially sound company.

The monetary figures presented in this document are derived from Amazon internal data and prepared in accordance to the above methodology for computing economic impact. The above methodology is not based on accounting standards and has not been subject to audits conducted by an independent accounting firm. Accordingly, the figures presented differ from in-country statutory financial statements and reporting.



# Glossary

- **Amazon CloudFront:** Amazon CloudFront provides businesses and web application developers with a secure and cost-effective solution for distributing content with low latency and high data transfer speeds. By using the AWS backbone network, CloudFront accelerates content distribution by routing each user request to the most optimal edge location that can best serve that content. Customers can enhance security with traffic encryption and access controls, and benefit from AWS Shield Standard, which defends against distributed denial of service (DDoS) attacks at no additional cost. Notably, Hulu relies on Amazon CloudFront to consistently provide high-quality video streaming services to millions of people.
- **Availability Zones:** AWS defines each group of logical data centers an Availability Zone. Each Region has a minimum of three Availability Zones, and each Availability Zone features one or more discrete data center(s), with redundant power, networking, and connectivity. If an application is partitioned across Availability Zones, companies are better isolated and protected from issues such as power outages, lightning strikes, tornadoes, earthquakes, and more. Availability Zones are physically separated by a meaningful distance, many miles, from any other Availability Zone, although all are within 60 miles (100 kilometers) of each other. The AWS infrastructure model has been recognized by Gartner as the recommended approach for running enterprise applications that require high availability. No other cloud provider offers as many Regions with multiple Availability Zones connected by low latency, high throughput, and highly redundant networking as AWS.
- **AWS GovCloud (US):** AWS GovCloud (US) is designed to meet the stringent security requirements of government customers and their partners in the United States, including the AWS GovCloud (US-East) and AWS GovCloud (US-West) Regions. AWS GovCloud (US) offers the flexibility to host sensitive data and regulated workloads while ensuring compliance with the highest and most stringent U.S. government security requirements. These AWS Regions are particularly effective when it comes to managing sensitive data types, including controlled unclassified information (CUI), personally identifiable information (PII), sensitive patient medical records, financial data, law enforcement data, and other similar datasets. For example, the Department of Veterans Affairs relies on AWS GovCloud (US) to securely store and protect critical patient data for U.S. veterans.
- **AWS Local Zones:** AWS Local Zones place select AWS capabilities, including compute, storage, and databases, closer to end users. With AWS Local Zones, customers can easily run highly demanding applications for their users, such as media and entertainment content creation, real-time gaming, simulations, and machine learning. For example, Epic Games uses AWS Local Zones to deliver enhanced player experiences for its popular Fortnite game.
- **Full-time equivalent (FTE):** Full-time equivalent (FTE) is a concept used to normalize full-time and part-time jobs, where two individuals working 50% of the time add up to one FTE.
- **Gross domestic product (GDP):** Gross domestic product (GDP) represents the monetary value of final goods and services produced in a country over a period of time.
- **Gross investment:** Gross investment includes the total costs paid by AWS to construct, connect, operate, and maintain AWS infrastructure across its full life cycle. These costs include the full value of capital expenditures (capex) and operational expenditures (opex) necessary to realize the project, such as imports of servers and employment of marketing professionals.
- **In-country (local) spending:** In-country spending includes purchases of goods and services from U.S. supply chains made to support AWS infrastructure and compensation paid to AWS employees and contractors in the U.S.
- **Jobs supported:** The jobs supported by AWS investment quantifies the number of full-time equivalent (FTE) jobs created and retained at businesses that supply AWS and its suppliers. Jobs at a given firm may support existing production demand and be retained by AWS investment or may also be created as a result of new demand.
- **Labor income (wages):** Labor income includes employee compensation (wages, salaries, and benefits) and proprietor income.
- **Manufacturing operations:** AWS is embracing three circular economy principles for our server racks by designing for reusability, keeping equipment operating efficiently, and recovering value from securely decommissioned equipment through reuse, repair, and recycling. AWS sends all functional, sanitized, retired server racks and components to its reverse logistics hubs to extend the useful life of data center hardware. There, server racks are securely demanufactured, and components are repaired and tested for reuse in our data centers. Learn more on [our website](#).
- **Output:** Output is the value of industry production (business revenue) minus any change in inventory.
- **Regions:** An AWS Region is a physical location where AWS clusters data centers.



