



Edge Computing with AWS Infrastructure Solutions

AWS Outposts | AWS Wavelength | AWS Local Zones

In an ever more connected world where we are all reliant on applications anywhere and everywhere, the need for companies to have cloud infrastructure and services where they need it the most has never been greater. While the cloud is growing rapidly and AWS Regions continue to roll out quickly, there are workloads where AWS infrastructure and services need to be brought even closer, in order to deliver low-latency, address data residency needs and unique local data processing requirements as well as data migration and IT modernization scenarios. AWS infrastructure solutions at the edge allow enterprises across all industries the opportunity to bring AWS services closer to where it's needed, such as on-premises with AWS Outposts, in large metro areas with AWS Local Zones, or at the edge of 5G networks with AWS Wavelength.

Edge computing at AWS provides infrastructure and software that move data processing and analysis as close to the end-point as necessary. This includes deploying AWS managed hardware and software to locations outside AWS data centers, and even onto customer-owned devices themselves.

The growing importance for edge computing in modern enterprises

Edge computing is essential for many existing and emerging applications, which need local processing of information to reduce the volume of traffic transported back to centralized data centers or the cloud for processing. By enabling compute capabilities closer to end users, businesses can provide new and innovative applications, and deliver immersive experiences to a wide audience. Yet, enterprises and developers face very real challenges in reaching their end goals of great experiences for customers, be it technical or regulatory reasons.

Enterprise challenges with edge computing:

- 1: Using different services, APIs and tools to run and consistently manage applications at the edge than what's in the cloud or on-premises
- 2: Procuring, managing and maintaining infrastructure (saving on staff or IT resources at edge locations)
- 3: Keeping some data at the edge for compliance, data processing/size or cost reasons

Edge computing with AWS infrastructure solutions

With global infrastructure that spans of 77 Availability Zones in 24 AWS Regions, AWS enables developers to serve end-users with low latencies worldwide. However, emerging interactive applications, like game streaming, virtual reality, and real-time rendering, require even lower latencies, sometimes in the single-digit milliseconds. In addition, use-cases like industrial automation, healthcare and autonomous vehicles require data processing to take place close to the source to conserve resources like device memory and power. In many use cases where applications involve collecting a lot of data, processing that data closer to the source saves on network bandwidth as well. Easy access to feature-rich cloud services at the 5G edge will enable modernization opportunities for enterprises, ISVs, and start-ups to develop innovative 5G applications and create new business segments.

AWS edge computing services provide infrastructure and software that move data processing and analysis as close to the endpoint as necessary. These include deploying AWS-managed hardware and software in locations outside AWS datacenters, and even onto customer-owned devices themselves. AWS gives you more edge specific capabilities than any other cloud provider. If you're already running your applications on Intel® Xeon® servers on-premises and benefiting from Intel software optimizations and tuning for enterprise applications, you'll enjoy the same robust performance on Outposts as well as the AWS cloud.

Why AWS for edge infrastructure solutions?

- **Use the most extensive global cloud infrastructure** – AWS is ushering in a new era of interactive applications and immersive experiences built for the edge and has the largest cloud infrastructure footprint of any provider - meaning AWS can serve more customers with the services they need and where they need it. For the areas not covered AWS supplements with its edge infrastructure solutions of AWS Outposts, AWS Wavelength and AWS Local Zones. AWS infrastructure is designed to meet the most stringent security requirements in the world and has the highest network availability of any cloud provider.
- **Move cloud closer to the endpoint** – Extend to the edge, beyond Regions, with the same network, control plane, APIs, and AWS services in each deployment.
- **Securely connect and manage devices at scale** – Use managed hardware at edge locations, with support for more security standards and compliance certifications than any other offering.
- **Use the deepest range of services and capabilities** – AWS has 175+ cloud and device services, more than any other cloud provider, plus capabilities for specific edge use cases.
- **Build more quickly and reduce costs** – Use a single programming model for the cloud and local devices. Build an application once and deploy it on the cloud or at the edge with consistent performance. This significantly shortens the development lifecycle and reduces development costs.

AWS cloud infrastructure solutions for supporting applications on-premises, in large metro centers and at the 5G Edge

AWS is helping millions of customers to innovate fast and lower costs. Yet some customers need compute, storage, analytics, and machine learning services beyond where AWS Regions exist today. Customers with modernization at the heart of their strategy need a consistent cloud infrastructure and AWS brings its services closer to customers through:

- **On-premises solutions** (AWS Outposts)
- **Metro area solutions** (AWS Local Zones)
- **5G Edge solutions** (AWS Wavelength)

AWS has edge-specific capabilities to suit your needs

Need an on-premises hybrid solution?

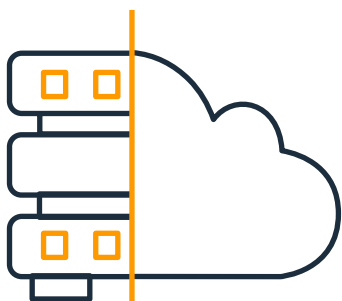
AWS Outposts

AWS Outposts is a fully managed service that extends AWS infrastructure, AWS services, APIs, and tools to virtually any data center, colocation space, or on-premises facility for a truly consistent hybrid experience where a business needs it most. AWS Outposts is ideal for workloads that require low latency access to on-premises systems, local data processing, or local data storage, as well as for data residency needs. Outposts meets the modernization challenge with its hybrid model and is perfect for migrating existing and legacy data.



Customers want to be able to run AWS compute and storage on-premises, and also easily and seamlessly integrate these on-premises workloads with the rest of their applications in the AWS cloud. That capability has not been possible until now because solutions have lacked the same APIs, tools, hardware, and functionality across on-premises and the cloud to deliver a true hybrid experience. If you're already running your applications on Intel® Xeon® servers on-premises and benefiting from Intel software optimizations and tuning for enterprise applications, you'll enjoy the same robust performance on Outposts as well as the AWS cloud.

AWS Outposts solves these challenges by delivering the same hardware used in AWS public region data centers to bring AWS services, infrastructure, and operating models on-premises. With AWS Outposts customers can choose from a range of compute, storage, and graphics-optimized EC2 instances, both with and without local storage options, and Amazon Elastic Block Store (EBS) volume options. Customers can then easily run a broad range of AWS services locally, including Amazon EC2, Amazon EBS, Amazon Elastic Container Service (ECS), Amazon Elastic Kubernetes Service (EKS), Application Load Balancer (ALB), Amazon Relational Database Service (RDS), and Amazon Elastic MapReduce (EMR), and can connect directly to regional services like Amazon Simple Storage Service (S3) buckets or Amazon DynamoDB tables through private connections.



AWS delivers and installs an Outpost to customers and handles all maintenance, including automatically updating and patching infrastructure and services as part of being connected to an AWS Region, so developers and IT professionals do not have to worry about procuring or maintaining their Outpost.

Learn more:
<https://aws.amazon.com/outposts/>

Need ultra-low latency experiences at the edge of 5G networks?

AWS Wavelength

AWS Wavelength is an AWS infrastructure offering optimized for mobile edge computing applications. Wavelength Zones are AWS infrastructure deployments that embed AWS compute and storage services within communications service providers' (CSP) data centers at the edge of the 5G network. When applications are deployed inside a Wavelength Zone, traffic from 5G devices can reach application servers without leaving the telecommunications network. This avoids the latency that would result from application traffic having to traverse multiple hops across the internet to reach their destination, enabling customers to take full advantage of the latency and bandwidth benefits offered by modern 5G networks.



AWS Wavelength empowers developers to build applications that deliver single-digit millisecond latencies to mobile devices and end-users. By achieving such low latency use cases such as gaming and live video streaming, machine learning inference at the edge, augmented and virtual reality (AR/VR), ML-assisted diagnostics for healthcare, connected vehicles, smart factories and more.

Learn more:

<https://aws.amazon.com/wavelength/>

Need AWS infrastructure and services at a local level?

AWS Local Zones

AWS Local Zones are a new type of AWS infrastructure deployment that places AWS compute, storage, database, and other select services closer to large population, industry, and IT centers where no AWS Region exists today. With AWS Local Zones, you can easily run latency-sensitive portions of applications local to end-points and resources in a specific geography, delivering single-digit millisecond latency for use cases such as media & entertainment content creation, real-time gaming, reservoir simulations, electronic design automation, machine learning and more.



Each Local Zone location is an extension of an AWS Region where customers can use AWS services such as EC2, VPC, EBS, Amazon FSx, Elastic Load Balancing, Amazon EMR, and RDS. Local Zones provide a high-bandwidth, secure connection between local workloads and those running in the AWS Region, allowing you to seamlessly connect to other AWS workloads and to the full range of in-region services through the same APIs and tool sets. AWS Local Zones are managed and supported by AWS, bringing all the elasticity, scalability, and security of the cloud.

Learn more:

<https://aws.amazon.com/about-aws/global-infrastructure/localzones/>

Security at the edge

Security at AWS is the highest priority. As an AWS customer, you benefit from a data center and network architecture that is built to meet the requirements of the most security-sensitive organizations. Security is a shared responsibility between AWS and you. [The shared responsibility model](#) describes this as security of the cloud and security in the cloud and on-prem:

- **Security of the cloud** – AWS is responsible for protecting the infrastructure that runs AWS services in the AWS Cloud. AWS also provides you with services that you can use securely. Third-party auditors regularly test and verify the effectiveness of our security as part of the [AWS Compliance Programs](#). AWS is responsible for protecting
- **Security in the cloud** – Your responsibility is determined by the AWS service that you use. You are also responsible for other factors including the sensitivity of your data, your company's requirements, and applicable laws and regulations.

Outposts' infrastructure similar to how it secures infrastructure in the cloud today. Customers are responsible for securing their applications running on Outposts as they do in the Region today. With Outposts, customers are also responsible for the physical security of their Outpost racks, and for ensuring consistent networking to the Outpost.

AWS enables innovative use cases

AWS infrastructure at the edge, either on-premises, in large metro areas or at the edge of 5G networks, is enabling all-new use cases that directly benefit from lower latencies and satisfies the requirements of local data processing and data residency needs.



AR/VR

By accessing compute resources on at the edge AR/VR applications can reduce Motion to Photon (MTP) latencies to meet the <20 ms benchmark needed to offer a realistic user experience. AWS enables offering AR/VR in locations where it is not desirable or possible to run local server systems.



Connected vehicles

Cellular Vehicles to Everything (C-V2X) is an increasingly important platform for enabling intelligent driving, real-time HD maps, road safety, and more. Low latency access through AWS edge infrastructure for data processing and analytics enables real-time monitoring of data from sensors for secure connectivity, in-car telematics, and autonomous driving.



Healthcare

Lower latencies improve processing in health management systems (HMS), the cornerstone of healthcare modernization. Locally stored medical data can be rapidly retrieved and processed. Also, AI/ML-driven video analytics and image matching solutions help doctors speed up diagnosis of observed conditions, such as recognizing polyps during colonoscopies. The image or video streams from medical devices can be processed at the edge and the response returned to the medical device for the surgeon to use.



Manufacturing

Process control systems (e.g. MES and SCADA) are latency sensitive and need to run close to factory floor equipment. Also, industrial automation applications use ML inference at the edge to analyze images and videos, in order to detect quality issues on fast-moving assembly lines and trigger actions to remediate the problem. AWS edge infrastructure enables all these applications to be achieved through modernizing the IT behind them.



Media and entertainment

AWS edge infrastructure solutions provide the ultra-low latency needed to livestream high-resolution video and high-fidelity audio, as well as to embed interactive experiences into live video streams. Additionally, real-time video analytics provide the ability to generate real-time stats that can enhance live event experiences. You can also access the latest GPU innovations on premises for graphics processing, audio and video rendering, and other media applications.



Real-time gaming

Real-time game streaming depends on low latency to preserve user experience. With edge infrastructure the most demanding games can be made available on end-user devices that have limited processing power by streaming these games from game servers closer to the edge.



AWS infrastructure solutions powered by Intel® processors.

Build on the same Amazon EC2 instances on premises powered by Intel® technologies. Amazon EC2 instances provide secure, resizable compute capacity in the cloud. EC2 is designed to make cloud computing easier and more scalable for developers.

AWS Outposts - You can choose from a range of pre-validated Outposts configurations designed to meet a variety of application needs. You can also contact AWS to create a customized configuration designed for your unique application needs. AWS Outposts catalog includes the latest generation Intel powered EC2 instance types with or without local instance storage.

AWS Wavelength - Wavelength Zones currently support instances for applications that need cost effective general purpose compute, and for accelerated compute (such as game streaming and ML inference at the edge that require GPUs), there's even more options.

AWS Local Zones - AWS Local Zones offer a selection of general purpose, compute optimized, memory optimized, accelerated computing, and storage optimized EC2 instance families.



Intel® Xeon®
Scalable processors

PARTNERS

Below are some highlighted technology and ISV partners.

