



AWS Wavelength for Media & Entertainment

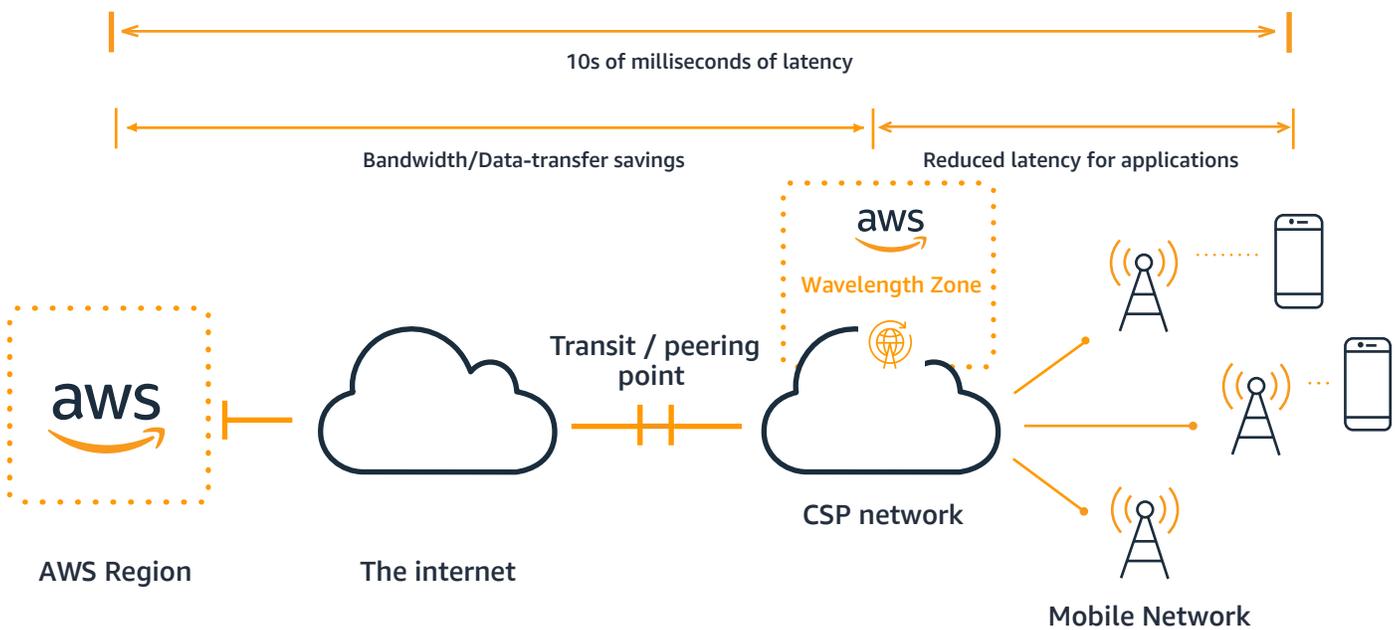
The promise of 5G

5G has the promise to deliver the next generation of mobile entertainment thanks to the ultra-high bandwidth, ultra-low latency, and higher reliability compared to the previous generation of mobile networks. These new capabilities open up a broad range of potential applications and use cases that are now possible, especially when the advancements in 5G networks are combined with powerful Edge Computing. These new applications that are already being explored include augmented and virtual reality, connected vehicles, smart cities, remote video production, remote health, 4K and 8K streaming video, and interactive gaming.



Bringing Powerful Edge Computing Services to 5G Networks

Advances in radio technology have enabled 5G networks to provide high-density radio (air) interfaces with extremely high bandwidth and reliability. However, improvements in the radio network alone might not be enough to meet the low latency requirements set by the 5G standards. Today, most consumer and enterprise applications that are accessed on mobile devices and other mobile end-points are hosted on application servers outside of the communications service provider's network. Enabling applications to be run in edge computing infrastructure, close to end users, is essential to improving the latency that the application experiences. By running applications closer to its end point, the latency that comes from the number of hops needed for an application to reach the compute, storage, and cloud services it requires can be reduced. Accessing these resources in the cloud using traditional mobile architectures requires several hops on the network (from a device, to a cell tower, to metro aggregation sites, to regional aggregation sites, to the internet, to the cloud—and then back through those stops before getting back to the device). This creates tens to hundreds of milliseconds of latency. The 5G network is up to 10 times faster than 4G, but to take full advantage of the latency improvements that 5G offers, the number of network hops needs to be reduced.



To address this challenge head on, AWS has partnered with leading Communications Service Providers (CSPs) to provide mobile edge computing infrastructure, AWS Wavelength, co-located within the carrier's network. This allows applications that need ultra-low latency access to end devices to be deployed much closer to the consumer, reducing latency and enabling the next wave of 5G applications and use cases.

One industry that is actively exploring the potential of 5G and Edge Computing is Media and Entertainment (M&E). Changes in social behavior, globalization, the ubiquitous reach of the mobile phone, and improvements in video, computing, and networking technologies have driven changes in the M&E industry.

The Changing Media and Entertainment Landscape



New Content Creation Paradigms

The proliferation of mobile devices and easy-to-use editing and production tools have resulted in an explosion of user generated content (UGC) like videos, podcasts, and planned and impromptu live-streams. Existing media companies are increasingly being forced to complete and match this new way of agile content creation. In addition to the democratization of content productions, there is a shift toward augmenting content with auxiliary information, often live and real-time. In a world of multi-modal, multi-device consumption of this content, producers are focused not only on creating base content, but the ability to rapidly package it into fast consumable slices.



New Consumption and Distribution Models

Today, consumers have moved to any device, any time, anywhere consumption of media – largely facilitated by digitalization of content and ubiquitous availability of mobile networks. Improving network bandwidths has increased expectations of higher quality and 4K/8K streaming are on track to being widely available. Non-linear content consumption and the decline of the standard way of content viewing also brings with it the need for more sophisticated advertising approaches to monetize content. With on-demand capabilities, media companies will need to provide their consumers with rapid access to extensive content libraries.



Evolving Technology and Platforms

Video production has steadily moved to the cloud-based platform over the past few years while virtualization and digital technology are fast supplanting existing studio equipment. AI/ML has become mainstream for improving the consumer experience, increasing engagement, and optimizing monetization opportunities. On the transport side, availability of 5G and ultra-high-speed uploads will change content acquisition and consumption dynamics.

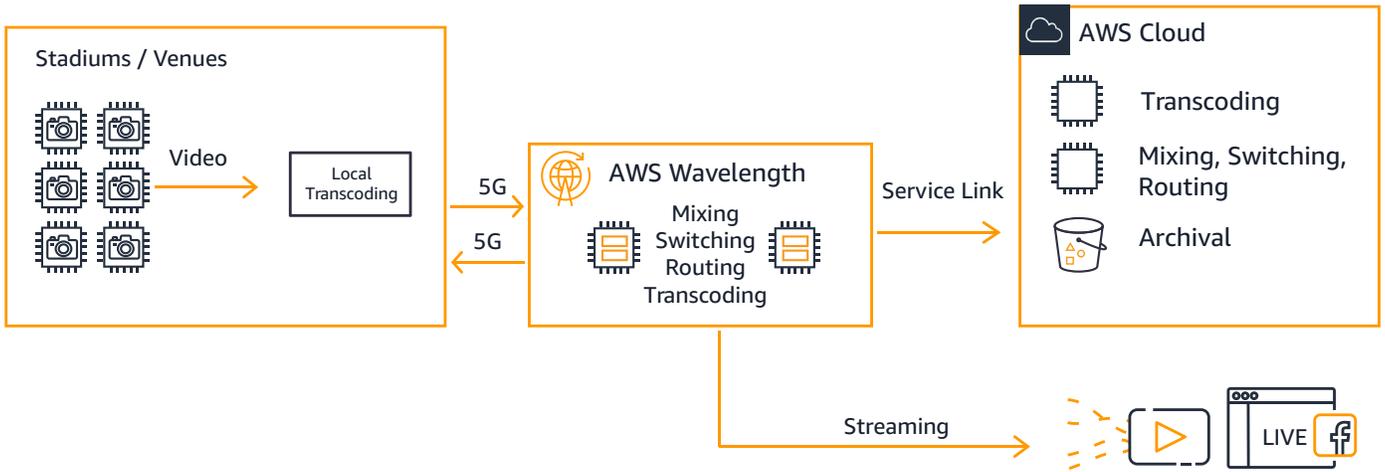
New applications and experiences made possible by AWS Wavelength

By bringing powerful cloud-based services and cloud computing infrastructure closer than ever to content consumption and content generation locations, AWS Wavelength will enable innovative media companies and Independent Software Vendors (ISVs) to bring new services and new experiences to market, faster.

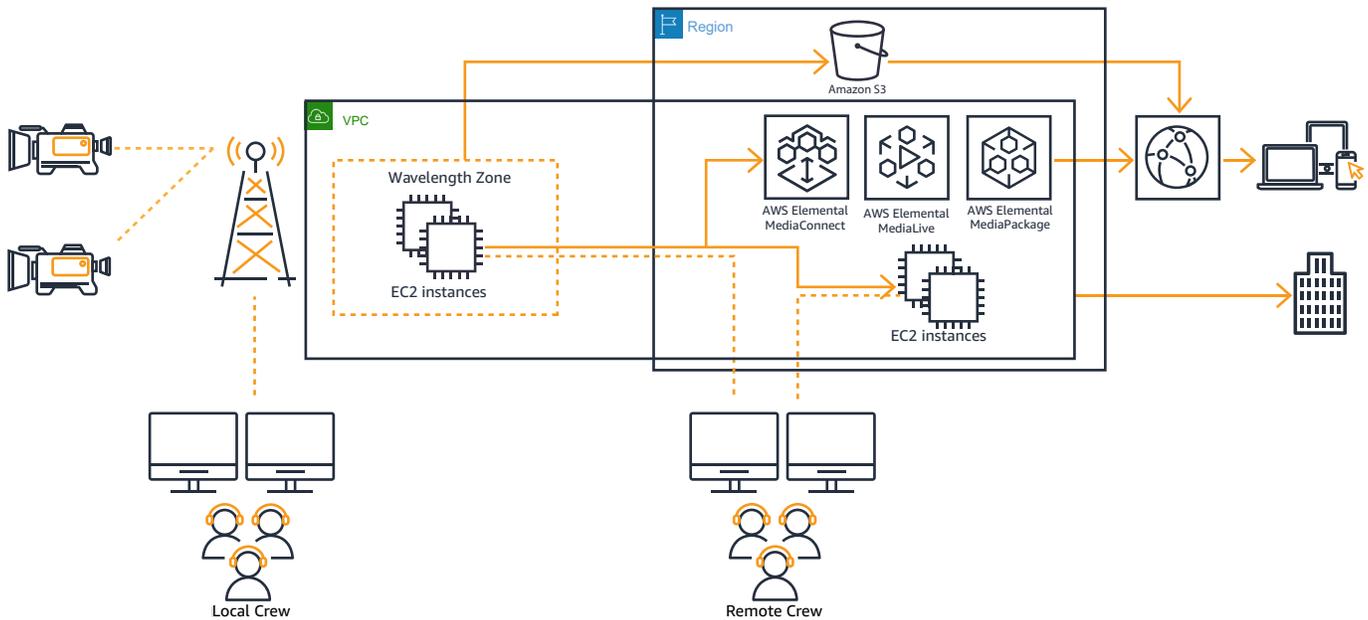
Wavelength as a Production Hub, especially for venue-based production.

The combination of 5G and mobile edge computing can dramatically change the way in which media and entertainment companies create, capture, manage, and distribute content, especially for live events. Content acquired at events can be streamed via a high-speed 5G network to the nearest Wavelength Zone. Production workflows for pre and post-event content can use the same planned infrastructure. This flexibility enables media companies to be independent of the production facilities and logistics available within different venues. Producers are able to pre-stage

media content and assets, such as advertisements and stock footage, into the nearest appropriate edge location for live insertion into the production workflow. The content is ingested and processed using software defined workflows running on Wavelength edge compute and GPU-enabled hardware, allowing for live editing and switching with very low latency. With all of the media assets in the mobile edge, compositing happens on the fly, enabling seamless management of pre-staged assets and multiple live feeds. Finally, media transcoding can also be performed at the edge, and then redistributed within the 5G network immediately or sent into the cloud for redistribution via a Content Delivery Network (CDN).



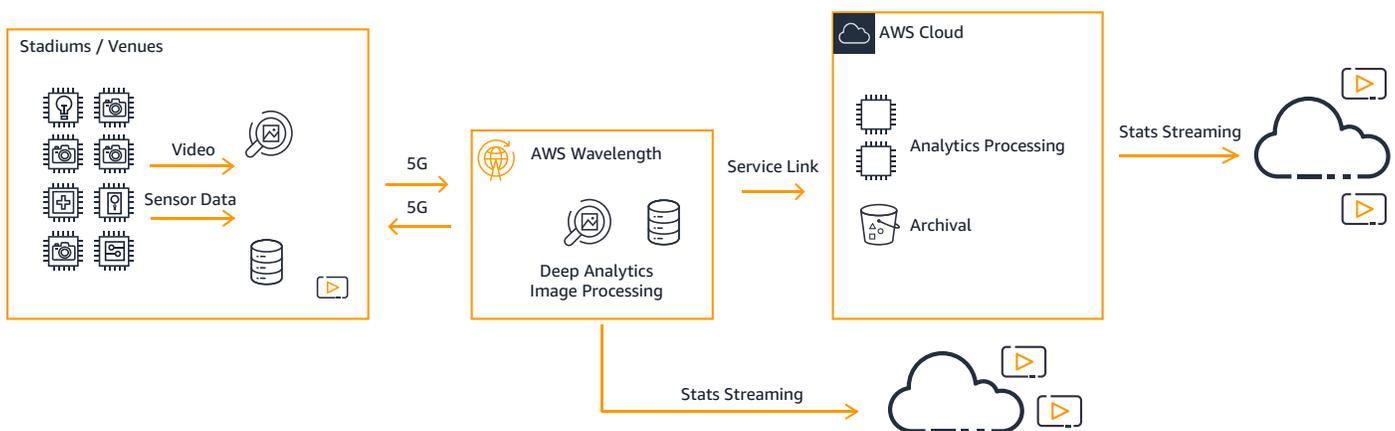
This diagram below shows how the contribution over 5G can be provided to compute instances in Wavelength Zones where video switching, audio mixing, and graphics is operated either by a local crew connected directly to the 5G network, or by a remote crew connected via an AWS Region.



Enhanced Live Event Experiences

Deploying Wavelength at the production stages allows for a new set of services to be offered to customers. Leveraging powerful compute, storage, and GPU hardware, live events can be enhanced by giving audiences a front row experience regardless of their location inside the stadium. A fan could be choosing which camera they want to view on their mobile device, and could have other live content inserted into their video feed, such as lyrics or text commentary, statistics or other fan facing content. It would also allow for augmented reality overlays to the live feed, and the capture and processing of multiple camera views to create a remote 3D viewing experience.

Using AWS Wavelength enables thin client applications to be served, meaning that users need less powerful devices to access and use the applications because powerful back end compute resources are much closer to the mobile edge. Doing so improves accessibility, lowers device power consumption, and enhances the user experience.



Interactive Video Streaming and Immersive Video

Shifting the back-end processing of live video to the mobile edge with AWS Wavelength enables the next generation of immersive and interactive video experiences. With the ability to encode video for all formats at the mobile edge and redistribute within the mobile network, new possibilities for enhanced viewing become possible. Being able to manage real time graphics and special effects and alternative camera angles' volumetric capture will give broadcasters many new possibilities for deeper and more engaging video experiences.

Virtual and augmented reality, game streaming, and real time rendering require very low-latency connectivity and access to powerful compute resources, including GPUs. Shifting the data and computational overhead to the mobile edge also reduces bandwidth consumption back to the AWS Region or your data center. What's more, it lessens the burden on centralized resources by keeping video traffic, encoding, and content production inside the carrier network.



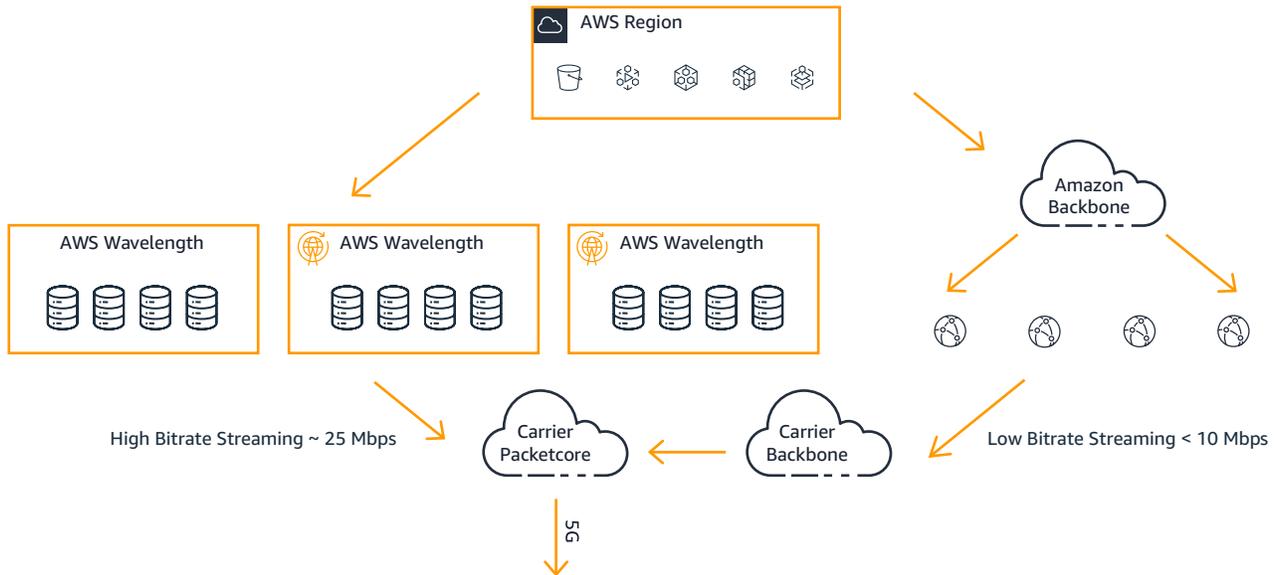
With Wavelength, the ability to broadcast live volumetric, immersive feed capture, stitched together in real time using multiple fixed camera feeds becomes a reality. Close proximity of the appropriate GPU-powered compute platforms handles such image processing, putting viewers right in the middle of the event through their VR headset. Imagine being able to watch a live sports event such as a football game from the comfort of your sofa but being able to enjoy all the sights and sounds of the stadium in a fully immersive 360 degree view. For media rights holders this could open up a significant opportunity to increase fan engagement. While a stadium has a fixed number of seats, the possibility of adding virtual attendees could increase the total audience tenfold, massively extending the reach and exposure for a team or event. This brings many possibilities for new and engaging viewing experiences, at many different types of events, opening new revenue models and expanding potential audience numbers.

Intelligent Caching at the Edge

For content consumption, AWS Wavelength can serve as a universal Content Distribution Network (CDN) that can be provisioned as needed to reduce media load times and improve user experience.

With a decentralized cache further at the edge, deep into carrier networks, subscribers will have better user experiences and faster downloads. Decreased start up times enable higher quality and enhanced features for video content, and improved experiences for data downloads such as OS & Application updates. Edge Caching on AWS Wavelength will reduce the strain on origin servers and peering and internet link and support scaling for high connection concurrency: from 100,000+ viewers of special events, to the latest software updates.

Coupling cloud computing and analytics opens up intelligent CDNs that can transform content on the fly, under direction from a control and orchestration system. Content owners operating their own cache can collect real metrics from both the cache server and the device applications. These metrics range from device type, consumption, duration, and user experience to chunk size, bitrate, and ABR ladder switching. Content owners can iterate and monetize against these metrics, improving the subscriber experience while properly leveraging content and advertising inventory.



Edge Caching in Wavelength is achieved with Amazon EC2 compute instances for processing, application, and data access to Amazon EBS (Elastic Block Storage) and regional database such as Amazon Aurora. With the Edge Cache application and data solution deployed on Wavelength behind an Application Load Balancer, subscribers on the carriers' network have direct access to the caching front end and data streaming service. Devices download content on the carrier network, without exiting to the internet, or traversing into the AWS Region. Deploying resources in an AWS Wavelength Zone is as just as easy as deploying in any AWS Availability Zone via the AWS Console, CLI or SDK. By leveraging AMI's and AWS CloudFormation, content owners can quickly and easily deploy Edge Cache servers to areas with anticipated high traffic. By using AWS Services or an AWS Partner solution to programmatically choose the best cache based on location, content availability, and capacity, users can achieve a better benefit-cost ratio. This improvement is made possible by limiting the ABR ladder for video content at the Edge to only the highest quality; as the devices are connecting much closer, they will be able to connect at a higher bitrate. Devices incapable of achieving that bitrate would fall back to a traditional CDN.

A Broad portfolio of AWS Services

AWS Edge computing services such as AWS Wavelength, are designed to put the cloud as close to the endpoint, or consumer, as possible. That way, they reduce application latency and improve application performance but still retain full and seamless control using the same console, APIs, tools, and AWS services used in an AWS Region. The same stringent security and operational management standards are applied to

edge computing, meaning that all the same principles and controls are applied, regardless of whether they are inside an AWS region or in an edge location. Customers can create EC2 instances, attach EBS storage, launch services such as databases and containers, and provision GPU-based compute resources for applications involving 3D graphics, video processing, or machine learning inference.



GET STARTED

With AWS Wavelength, you can leverage the partnership between AWS and leading 5G mobile network providers to deliver the next generation of interactive mobile apps 4K/8K video and fully immersive entertainment experiences. Using the same AWS Cloud services at the edge of the mobile network, your organization can unlock new services, new offerings, and new revenue streams — all while utilizing the same AWS Cloud Services as used in an AWS Region.

Click here to find out more:
<https://aws.amazon.com/wavelength>

