Innovations in media and entertainment, driven by Verizon 5G Edge with AWS Wavelength
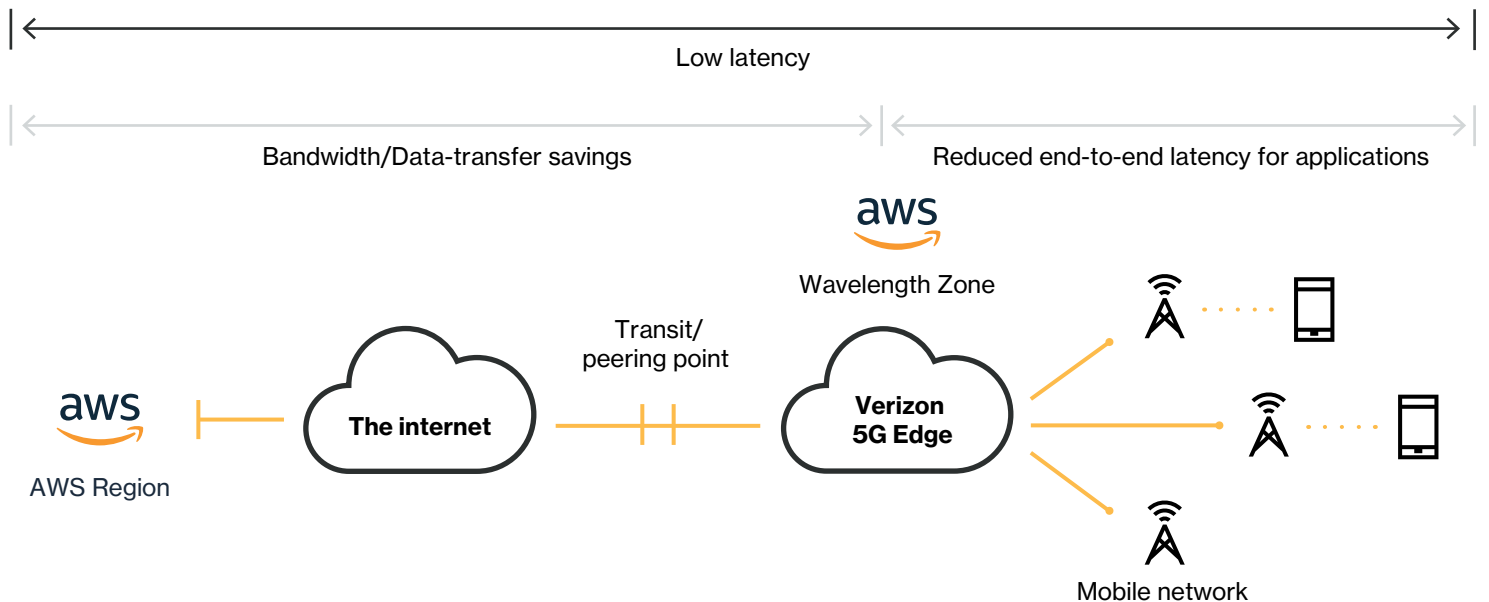
Tools for transformation

5G Ultra Wideband promises to deliver the next generation of mobile entertainment, thanks to its ultrahigh speed, ultralow latency and massive capacity compared to the previous generation of mobile networks. These new capabilities open up a broad range of potential applications and use cases, especially when the advancements in 5G networks are combined with mobile edge computing and public clouds. New applications that are already being explored include augmented and virtual reality (AR and VR), connected vehicles, smart cities, remote video production, remote healthcare, 4K and 8K streaming video, and immersive, cloud-based gaming.

Bringing edge computing services to 5G networks

Advances in radio signaling and processing techniques coupled with larger amounts of available radio resources have enabled 5G networks to provide substantially increased system and user bandwidth. In addition, applications can take advantage of the enhanced signal and system reliability capabilities supported by the improvements in radio processing techniques. However, improvements in the radio network alone might not produce all the latency improvements possible with 5G. Today, most consumer and enterprise applications that are accessed on mobile devices and other mobile endpoints are hosted on application servers outside of the communications service provider's network.

Accessing resources in the cloud using traditional mobile architectures requires several hops on the network (from a device to a cell tower, then to metro aggregation sites, regional aggregation sites, the internet, the cloud—and then back through those stops returning to the device). This can create tens to hundreds of milliseconds of latency. The 5G network can be significantly faster than 4G, but to provide further latency improvements to what 5G networks can offer, network hops also need to be reduced. And that can be accomplished by enabling applications to be run in edge computing infrastructure—and closer to the end user or device.

To address the latency challenge head on, AWS has partnered with Verizon to provide a mobile edge computing infrastructure—AWS® Wavelength—colocated within Verizon's 5G Edge network. This allows applications that require ultralow latency to be deployed much closer to the end user, reducing end-to-end latency and helping to enable the next wave of 5G applications and use cases.

The media and entertainment industry is actively exploring the potential of 5G and mobile edge computing. Many factors, including changes in social behavior, the ubiquitous reach of smart devices and advancements in video, computing and networking technologies are driving major advancements in the 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), including videos, podcasts, and planned and impromptu livestreams. Existing media companies are being forced to compete and match these new, more agile methods of content creation. In addition to this democratization of content production, there is a shift toward augmenting content with auxiliary information, often live and in near real time. In a world of multimodal, multidevice consumption, producers are focused not only on creating base content, but on rapidly packaging it into quick, consumable slices.

New consumption and distribution models

Consumers have moved to an anytime, anywhere, on-any-device media consumption model, largely facilitated by the digitalization of content and ubiquitous availability of mobile networks. Improving network capacity is increasing expectations of higher quality, and 4K/8K streaming are on track to being widely available. Nonlinear content consumption and the decline of traditional ways of content viewing are also driving the need to monetize content in new ways. Additionally, with on-demand capabilities, media companies also must provide consumers with rapid access to extensive content libraries.

Evolving technology and platforms

Video production has steadily moved to cloud-based platforms over the past few years, while virtualization and digital technology are fast supplanting existing studio equipment. Producers are increasingly using artificial intelligence/machine learning (AI/ML) to improve the consumer experience, increase engagement and optimize monetization opportunities. On the transport side, increasing availability of 5G, with the ability to upload at ultrahigh speeds will be changing content acquisition and consumption dynamics.
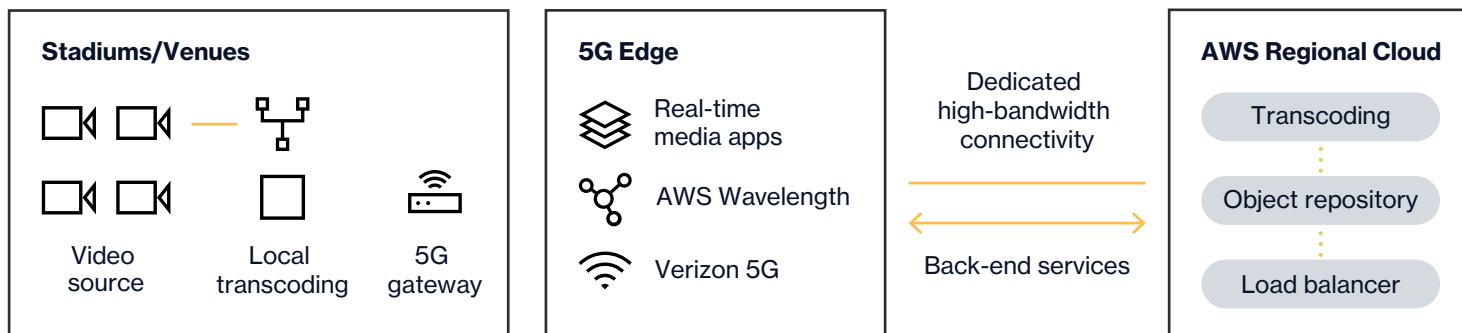
New applications and experiences made possible by AWS Wavelength and Verizon 5G Edge

By bringing powerful cloud-based services and cloud computing infrastructure closer to content consumption and content generation locations, AWS Wavelength and Verizon 5G Edge can enable innovative media companies and independent software vendors (ISVs) to bring new services and experiences to market faster.

Verizon 5G Edge with AWS Wavelength as a production hub platform for venue-based production

The combination of 5G and mobile edge computing could dramatically change the way media and entertainment companies create, capture, manage and distribute content, especially for live events. Content acquired at events can be streamed via the Verizon 5G network to the nearest Wavelength Zone. Production workflows for pre- and postevent content could use the same planned infrastructure. This flexibility can enable media companies to be independent from the production facilities and logistics available within different venues. Producers will be able to prestage media content and assets, such as advertisements and stock footage, to the nearest 5G Edge node for live insertion into the production workflow. The content would be ingested and processed using software-defined workflows running on AWS Wavelength edge compute and GPU-enabled hardware, allowing for live editing and switching with ultralow latency. With all of the media assets in the mobile edge, compositing happens on the fly, enabling seamless management of prestaged assets and multiple live feeds. Finally, media transcoding can also be performed at the edge, and then immediately redistributed within the 5G network, or sent into the cloud for redistribution via a content delivery network (CDN).
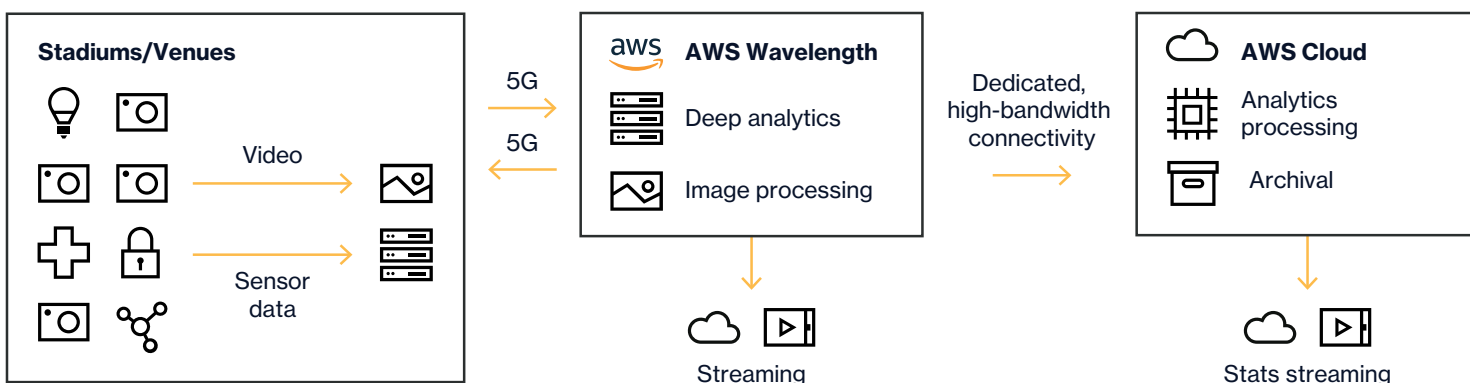
Stadiums/Venues

Video source | Local transcoding | 5G gateway

5G Edge

Real-time media apps

AWS Wavelength

Verizon 5G

Dedicated high-bandwidth connectivity

Back-end services

AWS Regional Cloud

Transcoding

Object repository

Load balancer

Enhanced live event experiences

Leveraging AWS Wavelength to provide compute, storage and GPU hardware services, live events could be enhanced by giving audiences a front-row experience, regardless of their location inside the venue. Fans could choose which camera's images they want to view on their mobile device, and have other live content inserted into their video feed, such as lyrics, commentary, statistics or other fan-facing content. 5G could also enable AR overlays to the live feed, and the capture and processing of multiple camera views to create a remote 3D-viewing experience.

Using AWS Wavelength could enable thin-client applications to be served, meaning users need less-powerful devices to access and use applications, because Verizon 5G Edge deploys powerful back-end compute resources much closer to the mobile edge. That could improve accessibility, lower device power consumption and enhance the user experience.

Stadiums/Venues

Video

Sensor data

5G
5G

AWS Wavelength

Deep analytics

Image processing

Streaming

Dedicated, high-bandwidth connectivity

AWS Cloud

Analytics processing

Archival

Stats streaming

Interactive video streaming and immersive video

Shifting back-end processing of live video through Verizon 5G Edge with AWS Wavelength could enable 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 view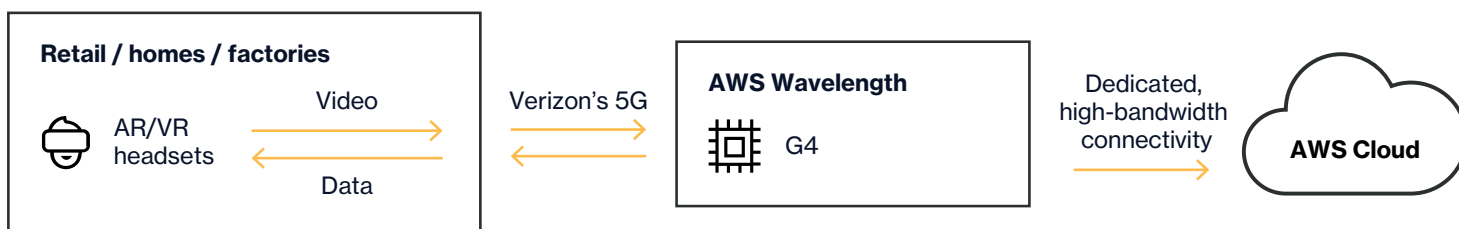ing arise. Being able to manage near real-time graphics, special effects and alternative camera angles' volumetric capture opens up new options for broadcasters to provide more engaging and immersive video experiences.

AR and VR, cloud game streaming, and real-time rendering require ultralow latency connectivity and access to powerful compute resources, including GPUs. Shifting the data and computational overhead to the mobile edge also reduces

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bandwidth consumption back to the AWS Region or data center. In addition, it lessens the burden on centralized resources by keeping video traffic, encoding and content production inside the carrier network.

With 5G Edge with AWS Wavelength, the ability to broadcast live volumetric and immersive feed capture, stitched together in real time using multiple fixed camera feeds, could become a reality. Close proximity of the appropriate GPU-powered compute platforms handles such image processing, and could put viewers right in the middle of the event through a VR

headset. Imagine being able to watch a live sports event, such as a football game, from the comfort of your sofa, and being able to enjoy all the sights and sounds of the stadium and a 360-degree view. For media rights holders, this could open up 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 creates many possibilities for new and engaging viewing experiences, at all types of events, and opens the door to new revenue models.

Intelligent caching at the edge

For content consumption, AWS Wavelength can serve as a universal CDN, provisioned as needed to reduce media load times and improve user experiences.

With a decentralized cache at the edge, deep into the carrier network, subscribers will have faster downloads and better user experiences. Decreased start-up times enable higher-quality and enhanced features for video content, and improved experiences for downloads such as OS and application updates. Edge caching on AWS Wavelength will reduce the strain on origin servers, peering and internet link, and support scaling for high-connection concurrency, whether it's a special event with 100,000-plus viewers or the latest software update.
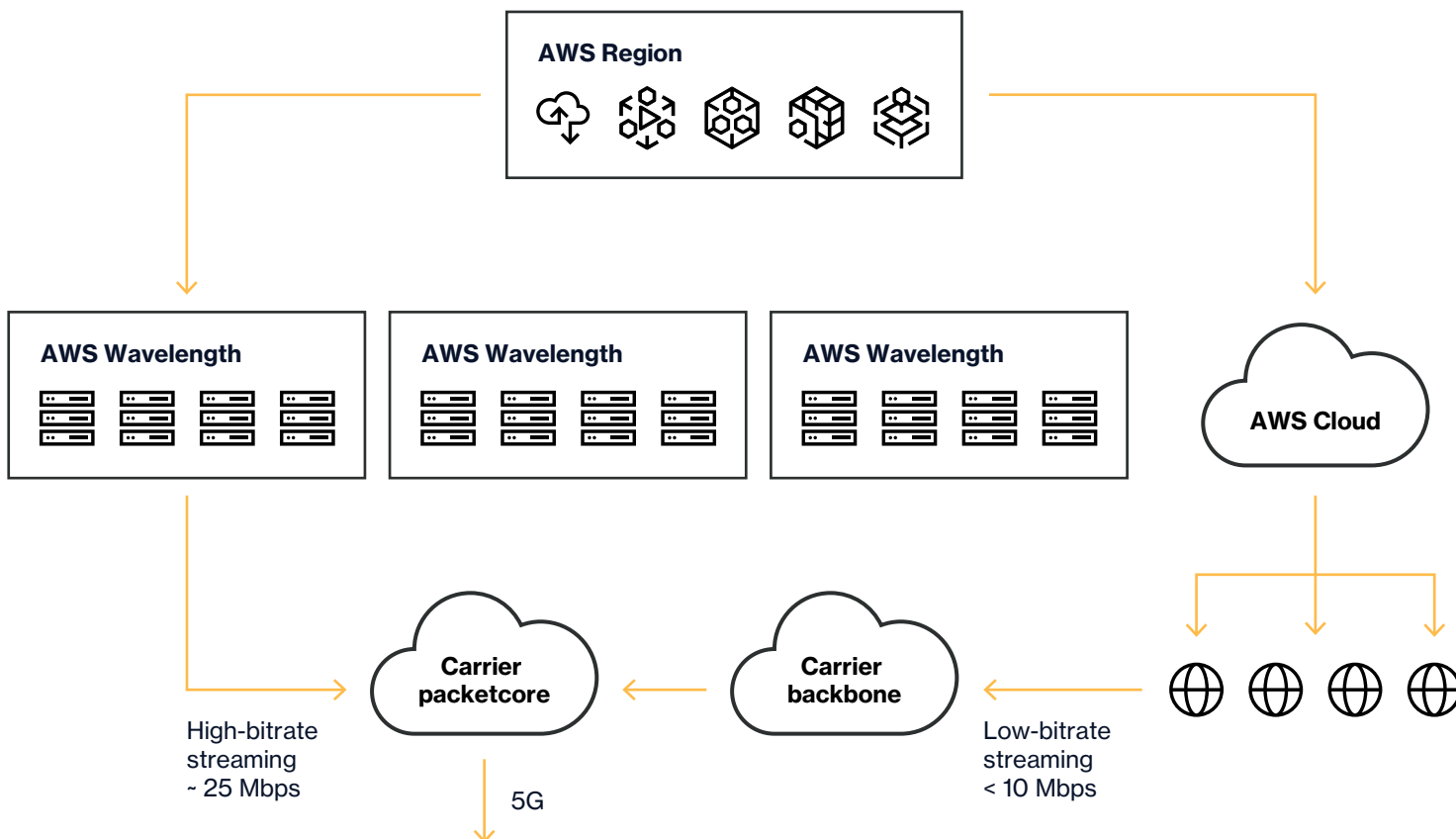
Coupling cloud computing and analytics can also open up intelligent CDNs that could transform content on the fly under the direction of a control and orchestration system. Content owners operating their own cache can collect real metrics from both the cache server and the device applications. These metrics 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 AWS Wavelength is achieved with Amazon Elastic Compute Cloud (EC2) compute instances for processing, application and data access to Amazon Elastic Block Storage (EBS) and regional databases such as Amazon Aurora. With the edge cache application and data solution deployed on AWS 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 a Wavelength Zone is just as easy as deploying in any AWS Availability Zone via the AWS Console, CLI or SDK. By leveraging Amazon Machine Image (AMI) and AWS CloudFormation, content owners can quickly and easily deploy edge cache servers to areas anticipating 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 array of applications

Together, AWS Wavelength and Verizon 5G Edge pull the cloud close to the endpoint or user, reducing application latency and improving performance, but still retaining full and seamless control using the same console, application programming interfaces (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 in an AWS Region or 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 Verizon 5G Edge and AWS Wavelength, you could deliver the next generation of interactive mobile apps, 4K/8K video and fully immersive entertainment experiences. Using AWS Cloud Services at the edge of the mobile network, your organization can unlock new services, offerings and revenue streams—all while utilizing the same AWS Cloud Services as used in an AWS Region.

Learn more:

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