Brief

Intel® Edge Content Streaming Service
Intel® Xeon® Processors

Intel® Edge Content Streaming Service:
A Cost-Effective and World-Class Streaming Platform

From captivating subscribers with live concerts and sports to empowering businesses with interactive webinars and conferences, the influence of live video streaming fundamentally transforms the way viewers engage and collaborate.

Globally, live video streaming has expanded dramatically, transcending its modest beginnings to reshape how people connect, entertain and learn, growing from $1.4 billion in 2023 to $1.63 billion in 2024 (a CAGR of 16.6%). It bridges geographical divides, ignites cultural exchange and redefines how we live.[1]

To deliver exceptional live experiences that captivate viewers and defy the limitations of the current environment, content providers must constantly innovate. This means diversifying partnerships, prioritizing delivery optimization, championing net neutrality and embracing cutting-edge technologies.

Today's live-streaming market challenges

- **Streaming broadcast quality video at scale:** The content streaming industry has been going through a consolidation phase of evolution due to price erosion and the cost of delivering quality video is expected to rise.
- **Quality of service:** Geographical limitations further exacerbate the issue, with distant servers causing latency and hindering real-time engagement.
- **Network neutrality:** Network neutrality concerns cause Internet service providers (ISPs) to prioritize traffic and fragment subscriber reach, stifling competition and innovation in the market.
- **Growing need for customization:** Content providers are increasingly seeking a more bespoke and private streaming solution while reducing CapEx spending.

Today's technical challenges require innovative solutions

- **Throughput:** Ensuring smooth delivery across diverse devices and network conditions remains a constant battle.
- **Complex audio/video workflow:** Content providers grapple with complex workflows involving encoding, caching and real-time delivery optimization, all while navigating the ever-evolving landscape of codecs and protocols.
- **Content protection:** Security and piracy concerns add another layer of complexity, demanding robust Digital Rights Management (DRM) solutions to protect valuable content.

Overcoming these market and technical obstacles require a deep understanding of the underlying infrastructure and a commitment to continuous improvement. Content providers must adopt intelligent platforms and tools that automate tasks, optimize delivery and provide real-time insights to ensure a seamless and secure live-streaming experience for every viewer.

Rising complexity with streaming, inconsistent quality due to oversubscribed capacity and the specter of network neutrality concerns all pose formidable obstacles. By tackling these challenges head-on, content providers can unlock the true potential of live video streaming and build a B2C future where subscribers are captivated, informed and connected. The Intel® Edge Content Streaming Service and our software and bare metal operator partners help content providers rise above the challenges and revolutionize the live-streaming game.

Intel Edge Content Streaming Service

Architecture overview

Imagine a world where live streaming is seamless, global and cost-effective. In this world, viewers experience pristine quality, lightning-fast speeds and uninterrupted connections, regardless of location or peak traffic. The innovative Intel Edge Content Streaming Service and our streaming software partners enable this reality, delivering exceptional power to content providers and captivating subscribers/viewers.

Powered by Intel's revolutionary edge-based technologies, it reimagines the way content providers broadcast to and engage with valued subscribers. As shown in Figure 1, the platform offers a complete solution for content providers, seamlessly bridging the gap between origin servers and viewers.

Live stream content originates from a central server of choice. Intel Edge Content Streaming Service seamlessly configures the streaming flows across multiple network providers with the highest coverage of video subscribers and strategically deploys edge servers in cities with the highest concentration of viewers. This intelligent platform orchestrated by Intel and our streaming partners acts as a digital vanguard, anticipating demand and proactively caching content closest to the viewer. As a result, content providers gain blazing-fast delivery, ultralow latency and a smooth viewing experience.

Primary platform features for content streaming

This platform addresses all live-streaming needs by handling the heavy lifting, so content providers can focus on what matters most, the content. Robust features include:

- **Zero capital investment:** Avoid expensive hardware and infrastructure costs, and shorten wait times. The platform's pay-as-you-go model transforms streaming into an operational expense, making it accessible to everyone.
- **Network neutrality champion:** The platform supports a strong peering network to address the need of the last-mile content delivery.
- **Memory caching for maximized throughput:** Innovative technology optimizes the efficiency of mid-tier, edge and storage pods, delivering the highest quality streams to viewers securely with minimal I/O strains.

Primary streaming software features provided by our partners

- **Full suite of security and management tools:** User authentication, stream encryption and DRM ensure content reaches the right eyes.
- **Smart routing, load balancing and auto-scaling:** Viewers are automatically directed to the closest edge server, providing optimal performance.

This service platform is more than just a live-streaming platform; it's a revolutionary solution provided by Intel and our software and bare metal operator partners in content delivery that empowers content providers, engages subscribers and pushes the boundaries of what's possible.

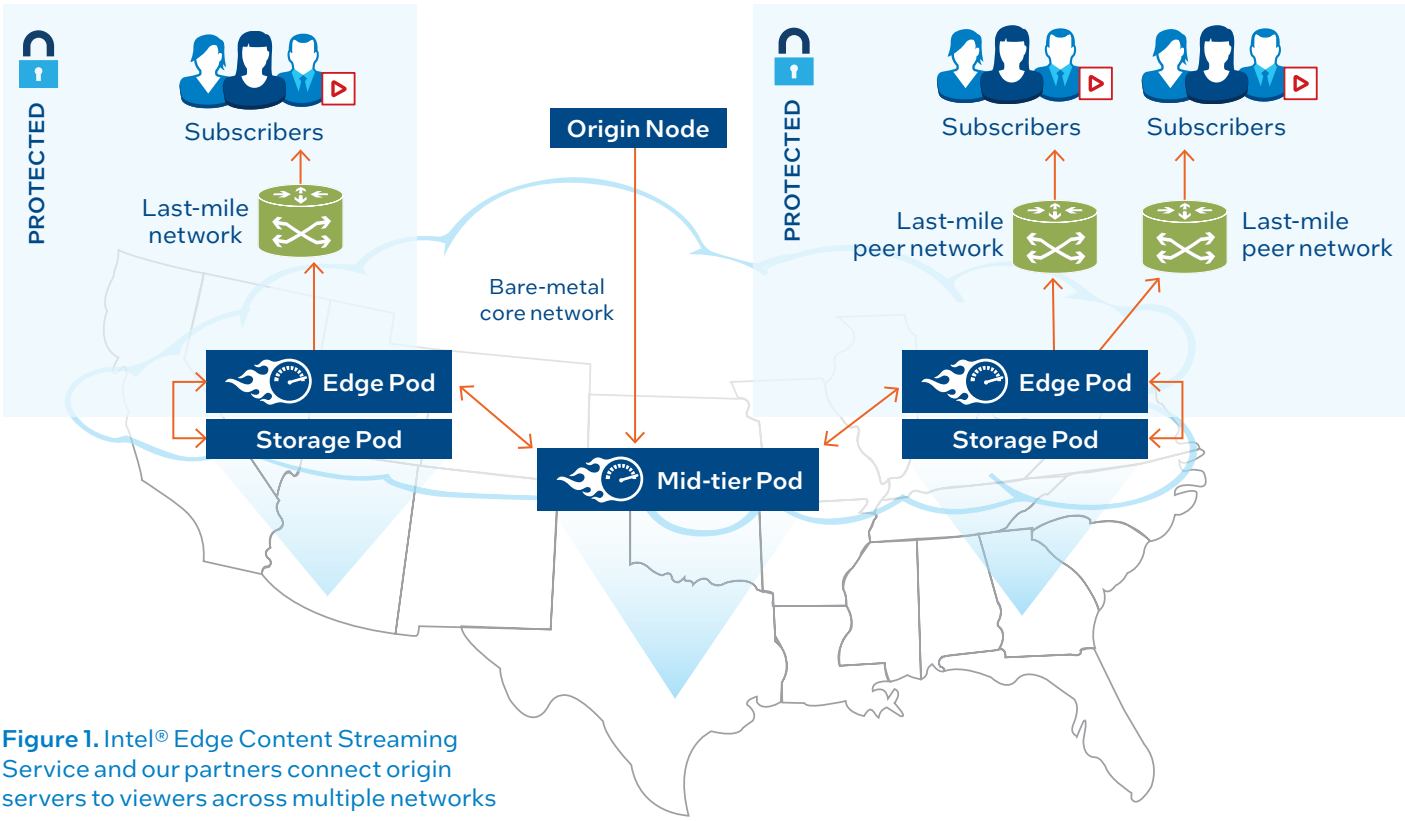

Figure 1. Intel® Edge Content Streaming Service and our partners connect origin servers to viewers across multiple networks

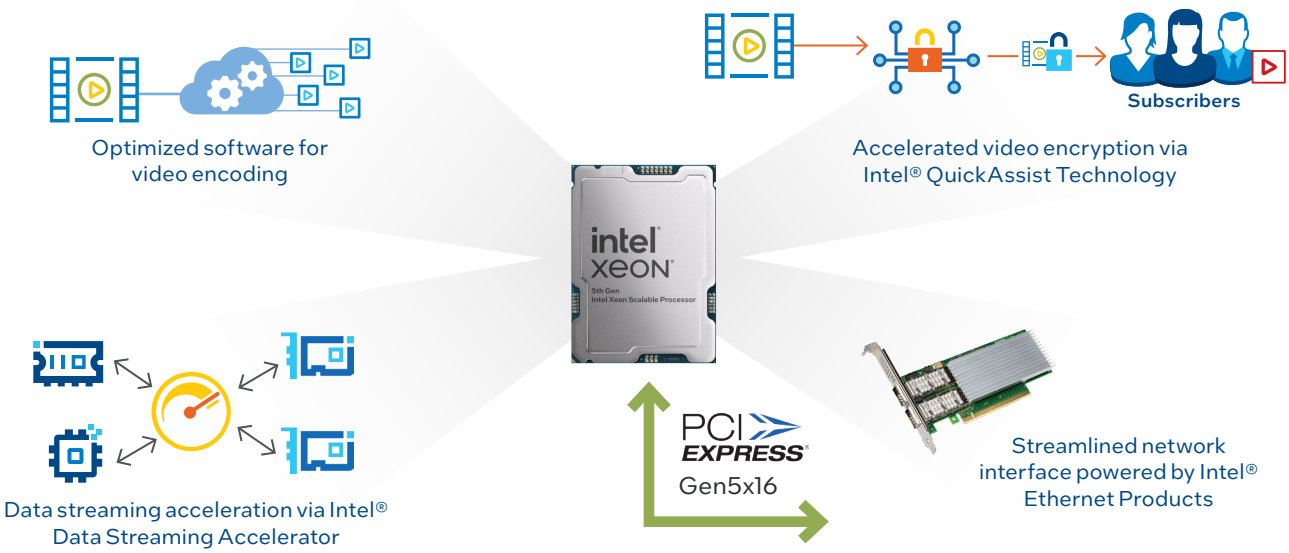

Figure 2. Components of the Intel® Edge Content Streaming Service optimized for Intel® Xeon® processors

Platform features offered by Intel® Xeon® processor-based servers

In the live-streaming business today, smooth, secured content delivery and captivating experiences for viewers are paramount. To unleash the streaming features of the platform, the software employed is optimized for the key ingredients that Intel Xeon processors offer, as illustrated in Figure 2.

The feature-rich solution includes:

- **Scalable architecture with accelerators:** Intel Xeon processors boast high memory bandwidth and core counts, enabling content providers to handle demanding media processing tasks like real-time encoding, transcoding and scaling with ease. By enabling parallel processing of multiple video streams and tasks, Intel Edge Content Streaming Service enables content providers to deliver data to a massive number of subscribers without compromising performance.
- **Intel Xeon processors are designed like an orchestra of specialized accelerators:** Intel® Advanced Matrix Extensions (Intel® AMX) offers accelerated performance of deep learning training and inference on the CPU. This can be used to enrich the live-streaming content, as well as to create interactive content that improves viewers' experiences and viewers' satisfaction and loyalty.
- **Security without overhead:** Intel Xeon processors integrate Intel® QuickAssist Technology (Intel® QAT), hardware-based engines that accelerate encryption tasks. This means content providers can secure content with standardized algorithms like Advanced Encryption Standard New Instructions (AES-NI) and Rivest-Shamir-Adleman (RSA) without sacrificing streaming throughput or adding latency when serving hundreds of thousands of viewers. Viewers enjoy a secure and smooth experience, and content developers get peace of mind.
- **Resource optimization — data streaming and delivering:** Intel® Data Streaming Accelerator (Intel® DSA) is a specialized hardware component designed to enhance the processing of data-intensive workloads, such as streaming data or media processing. It improves system performance for video workloads without burdening CPU cores, which leads to shorter latency, better energy efficiency and enhanced video quality when incorporating special video processing components. In addition, Intel Xeon processors are NUMA (non-uniform memory access) aware, meaning they understand the intricacies of multi-socket architectures. This translates to efficient resource allocation, ensuring each streaming platform utilizes every core and every byte of memory to its fullest potential without wasting any time.
- **Unleash the network beast:** Intel® Ethernet products, specifically designed for high-bandwidth streaming, work hand-in-hand with the Intel Xeon processors and Intel DSA to deliver blazing-fast data transfer rates. Viewers experience near-instantaneous delivery regardless of their location. No more buffering: just pure, uninterrupted streaming bliss.

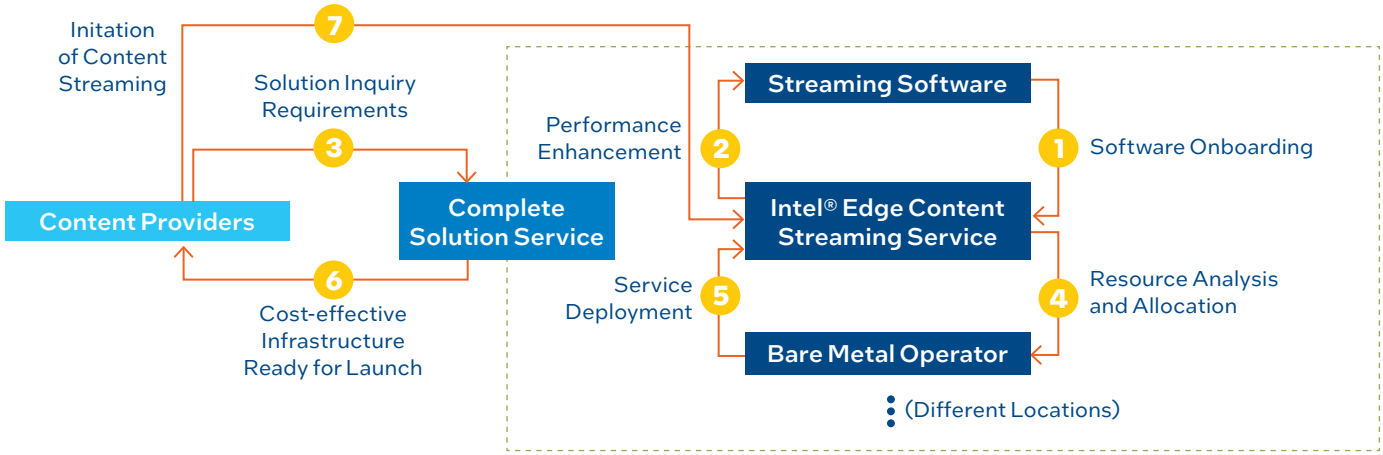

Figure 3. Streaming-centered solutions coupled with world-class Intel® hardware deliver on the Intel® Edge Content Streaming Service promise

Optimization software and hardware for streaming workloads

Optimizing cost and efficiency: How does it work?

The Intel Edge Content Streaming Service merges advanced streaming technology with the robust capabilities of Intel's software and hardware ecosystems, crafting a comprehensive suite designed for content providers. This platform stands out by facilitating access to an optimized mix of streaming software and hardware, tailored to meet the dynamic quality and cost needs of the live streaming market. Leveraging the powerful Intel Xeon processors, the service meticulously evaluates content delivery software to uncover optimization opportunities across encoding, processing, and delivery. This analytical approach ensures a superior viewing experience for end-users by maximizing performance and efficiency.

Backed by Intel's unparalleled hardware expertise and deep insights into live streaming workloads, the platform offers strategic guidance to edge bare-metal operators. This includes server configuration optimizations and equipment renewal strategies, aimed at enhancing server performance and operational cost-effectiveness. Content providers, in turn, receive detailed recommendations to achieve the perfect synergy of core count, memory, and networking capabilities. Such precision engineering ensures peak system performance, delivering cost efficiency and optimizing return on investment.

The operational framework of the Intel Edge Content Streaming Service is built on a foundation of critical stages:

1. **Software Integration and Onboarding:** Intel engages with elite, high-performing content streaming network software vendors, incorporating them into the Intel Edge Content Streaming Service ecosystem. This integration offers content providers thoughtfully chosen streaming solutions.
2. **Optimization and Performance Enhancement:** Collaborating closely with content streaming software vendors, Intel fine-tunes their delivery solutions to fully exploit the advanced capabilities and accelerators of Intel Xeon processors and Ethernet solutions. This strategic optimization enhances service throughput which leads to minimizing operational costs for running streaming business workloads.
3. **Solution Inquiry by Content Providers:** Content providers approach Intel with precise requirements concerning geographic deployment and capacity, aiming to efficiently serve their audience in specific markets.
4. **Resource Analysis and Allocation:** Intel carefully evaluates and selects the appropriate hardware and networking solutions within the desired regions, as specified by content providers, to architect a managed service infrastructure.
5. **Service Deployment and Configuration**: Intel provisions this tailored infrastructure to the chosen software stack, enabling the deployment of highly optimized streaming frameworks and applications.
6. **Service Ready for Launch:** Upon finalizing the content streaming infrastructure, Intel notifies content providers of the service's operational readiness. This stage ensures the platform is primed to connect with origin servers for seamless content distribution to targeted audiences.
7. **Initiation of Content Streaming:** With the service infrastructure in place, content providers commence routing subscriber traffic to the platform. This launch marks the beginning of delivering content with an enhanced viewer experience, achieved through an optimized cost structure that supports scalability for reaching extensive viewer bases efficiently.

Building new momentum for content streaming market

Intel Edge Content Streaming Service bridges the gap between software and hardware, operating as an optimization catalyst for the entire live-streaming community. Content distribution software vendors crafting the next generation of streaming tools and bare metal operators building powerful edge networks gain momentum by unlocking the full potential of streaming content and delivering exceptional live experiences that captivate subscribers worldwide.

[1] Research and Markets, January 2024. "Live Streaming Pay-Per-View Global Market Report 2024."https://www.researchandmarkets.com/report/livestream.

0324/RC/MESH/PDF 358253-001US