Building an Ecosystem: Transcoding for 24x7 Live Linear

A COMPLEX ECOSYSTEM

With the proliferation of viewing platforms, file formats and streaming technologies competing in today's online media ecosystem, video transcoding is becoming increasingly complicated and cumbersome. Efficiently managing cloud transcoding has become paramount in an increasingly complex and fragmented device ecosystem. As such, most cloud transcoding discussions have revolved around rapidly adding new capabilities to support the surge in formats and codecs, while also simplifying workflows.

However, as the value of content services increases and businesses look towards launching their own 24x7 live linear offerings, the operational impact of managing a transcoding system also becomes highly critical. Transcoding solutions now need to provide support in a 24x7x365 environment, while delivering a TV-like experience to online audiences.

TRANSCODING IN A 24X7 LIVE LINEAR ENVIRONMENT

A live transcoding system undoubtedly needs to support a variety of formats and bitrates, and be able to optimize picture quality to match user expectations. For cloud transcoding services of the future to truly serve the growing 24x7 live linear market, the conversation needs to shift to how transcoding fits into a larger ecosystem. Content providers must consider other components of the ecosystem that help provide a quality viewing experience for their audiences, including:

1. Reliable ingest of streams
2. Low-latency support
3. 24x7 availability and redundancy
4. Visibility
5. Formats and quality

A Transcoding System Designed to Enable 24x7 Live Linear Streaming

IAS = Ingest Acceleration Source
IAT = Ingest Acceleration Target
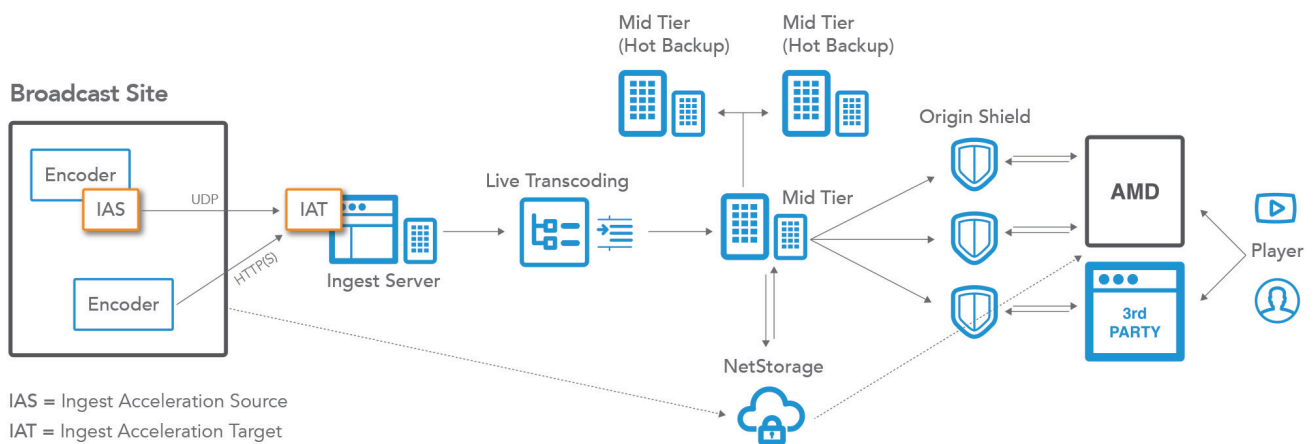
~10s for all HTTP(S) Ingested formats

Knowing the importance of a high-performance ecosystem, Akamai developed live transcoding functionality after ensuring its full integration into our liveOrigin™ solution. liveOrigin™ is a collection of capabilities that encompasses all the components listed above and was designed to overcome the challenges of delivering broadcast-quality 24x7 live linear streams.

A high-performance transcoding solution, complemented with the capabilities listed above, is what would enable content providers to truly deliver differentiated value to their online audiences.

1) RELIABLE INGEST OF STREAMS

Quality starts in the first mile. The best live transcoding system won't provide much value unless content is reliably ingested from the encoder. Akamai's ingest acceleration technology uses proprietary UDP transport protocol to improve performance and throughput of content when transferring streams into the cloud.

The Ingest Acceleration Source (IAS) software (downloaded through Akamai's customer portal) takes the stream from the customer's encoder, and forwards it over our proprietary UDP transport protocol. It is received by the Ingest Acceleration Target (IAT), where the stream is decoded into it's original format and handed to the entry point software for further processing.

This process enables fast, consistent, and reliable ingest of content. UDP technology is also used to improve the quality of the live feed even in cases of packet loss to end-user devices through Akamai's Delivery platform.
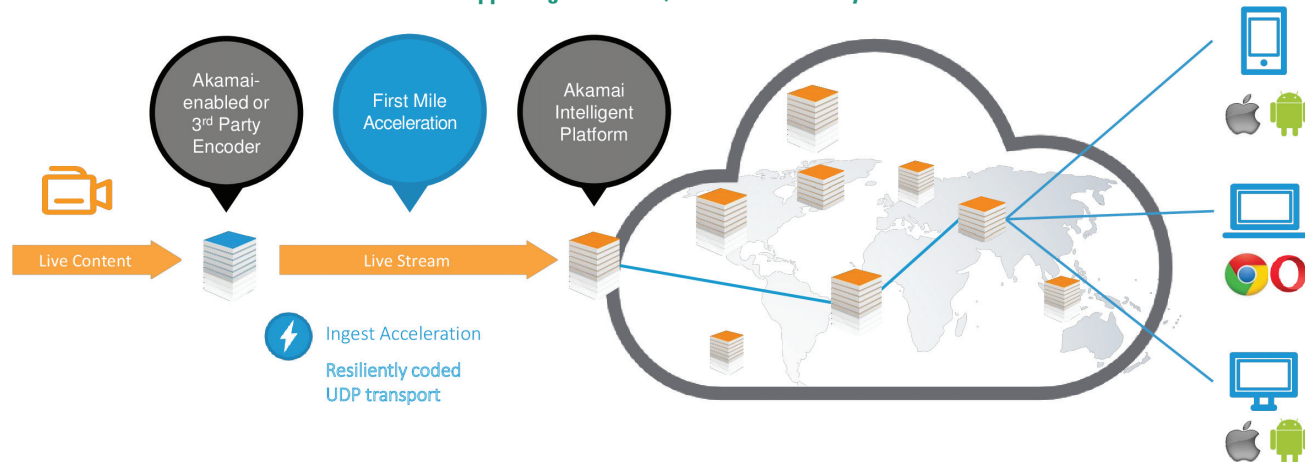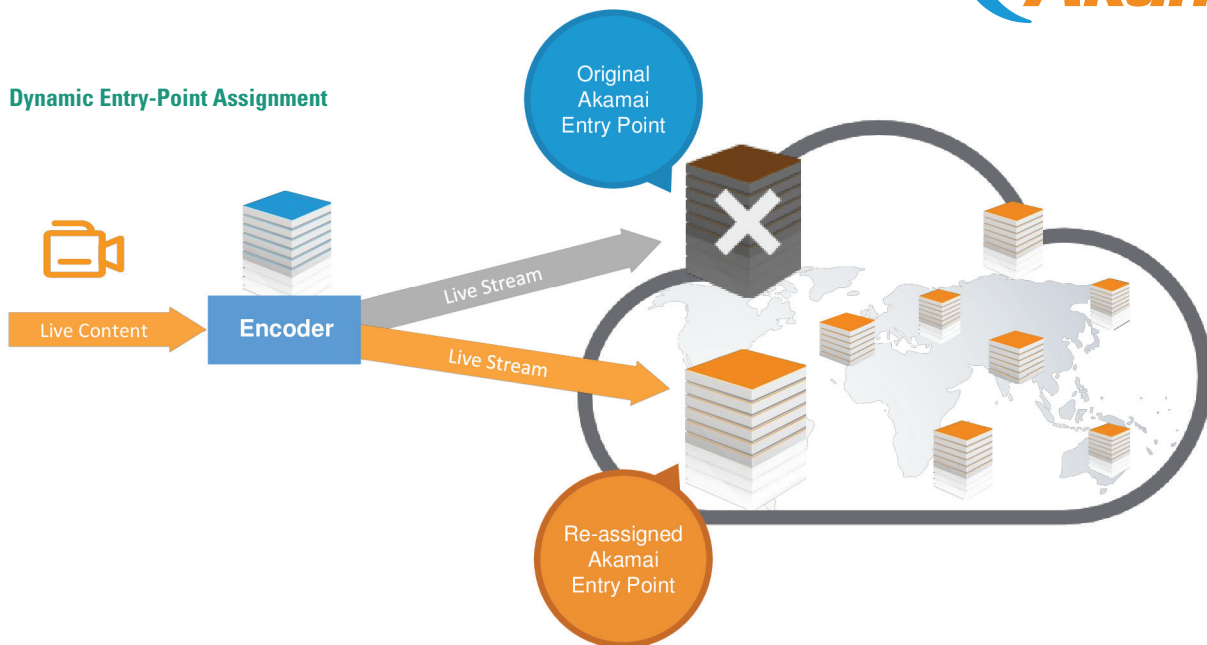
2) LOW-LATENCY SUPPORT

Until now, the online experience could be delayed anywhere from to 30 seconds to 2 minutes behind broadcast. To deliver a quality experience to their online viewers, content providers need to ensure that their transcoders aren't adding additional latency to their live linear streams.

Akamai supports 10-second end-to-end, hand-wave latency for live linear and live streams through combining several key capabilities that span from ingest to Edge servers. Several of these capabilities are as follows:

- **Live transcoding in real time**: A live transcoding system needs to elastically scale to handle peak loads of video in real-time. Any latency added during transcoding is ultimately passed on to the end user, resulting in a less than optimal viewing experience.

- **Small segment sizes:** Akamai's architecture was built to reliably handle small segment sizes (down to 2-seconds) for HTTP-based streaming to enable players to quickly switch down on bandwidth drops and prevent player stalls and effectively reduce client-side buffers.

- **HTTP chunked encoded transfers:** Supporting chunked encoded transfers from ingest through to the Edge to initiate transfers as soon as the data is available helps minimizes latencies.

- **Prefetching from the Edge:** Edge servers will pre-fetch the next set of segments for a particular bitrate and cache it locally as the previous segment

Supporting 10-second, hand-wave latency

Live Content — Akamai-enabled or 3rd Party Encoder — First Mile Acceleration — Live Stream — Akamai Intelligent Platform

Ingest Acceleration
Resiliently coded UDP transport

Dynamic Entry-Point Assignment

is already received and being played. This allows segments to be readily available and reduces risk of additional latency.

3) 24X7 AVAILABILITY AND REDUNDANCY

Video failures have a tangible, negative impact on viewers and their future perceptions of brands - Only 8.2% of viewers returning to a site within 24 hours after a video failure. Content providers need to ensure their cloud-based live transcoding system is operating at near-perfect availability and redundancy.

There are several capabilities Akamai utilizes to achieve unparalleled 24x7 reliability and redundancy through enabling flexible allocation of resources and routing of video assets:

• **Segment replication:** Akamai creates multiple copies of each segment upon ingest, enabling the transcoding system to access the assets from multiple locations. Each segment can also be pulled from several different locations when the transcoding system prepares the video. In the event the transcoding systems fails to retrieve the asset from one location, it reroutes to fetch segments from another source.

• **Load balancing:** Once the segment enters the transcoding system, Akamai's load balancing system optimizes how segments are sent to transcoding resources.

• **Dynamic entry-point assignment:** Akamai Entry Points use dynamic assignment to assign encoders to an optimal Entry-Point. The same mapping technology also allows Akamai to reroute streams to a new Entry Point should network conditions change.

4) VISIBILITY

Understanding how a 24x7 live linear stream is performing empowers content providers to quickly identify and mitigate issues. Near real-time monitoring and insights into the transcode process, complemented by visibility into stream health and first-mile performance, is key to optimize processes and take corrective action as needed. Akamai provides near-real time visibility into critical first-mile performance metrics, such as:

• Latency
• Number of current streams
• Bitrates being ingested
• Fluctuations over the past hour
• Packet loss
• Errors

FORMATS AND QUALITY

Audience expectations are rising and quality issues pose the biggest threat to attracting and retaining subscribers and viewers of an OTT service. An independent study conducted by Columbia University on why Quality of Experience (QoE) is more important than Quality of Service (QoS), the importance of

delivering a smooth viewing experience was stark. Abandonment rates increased by more than 4x with when bitrates shifted in comparison to when kept constant (**go2sm.com/columbiauniversity**).

At this point it should be clear that having the most sophisticated transcoding system on the market by itself can't deliver a high quality 24x7 live linear stream viewers in isolation. The reverse is also true. The capabilities discussed above are relatively meaningless unless they work in concert with a transcoding engine to help deliver the best experience possible to online audiences across a wide array of formats and devices.

To help overcome quality challenges, Akamai's Live Transcoding supports:

- Ingestion of bitrates up to 20Mbps from a single HLS stream for maximum output quality

- Default support for 1080p video formats to enable the best picture quality for end-viewers

- Support for leading adaptive bitrate formats

- Optimized transcoding profiles designed to reduce total bandwidth while preserving picture quality

Reach out to us at **www.Akamai.com** or contact your Akamai rep for more information on our 24x7 Live Linear solution with Media Services Live.

ABOUT AKAMAI TECHNOLOGIES
As the global leader in Content Delivery Network (CDN) services, Akamai makes the Internet fast, reliable and secure for its customers. The company's advanced web performance, mobile performance, cloud security and media delivery solutions are revolutionizing how businesses optimize consumer, enterprise and entertainment experiences for any device, anywhere. To learn how Akamai solutions and its team of Internet experts are helping businesses move faster forward, please visit **www.akamai.com** or **blogs.akamai.com,** and follow **@Akamai** on Twitter.

The Akamai Ecosystem
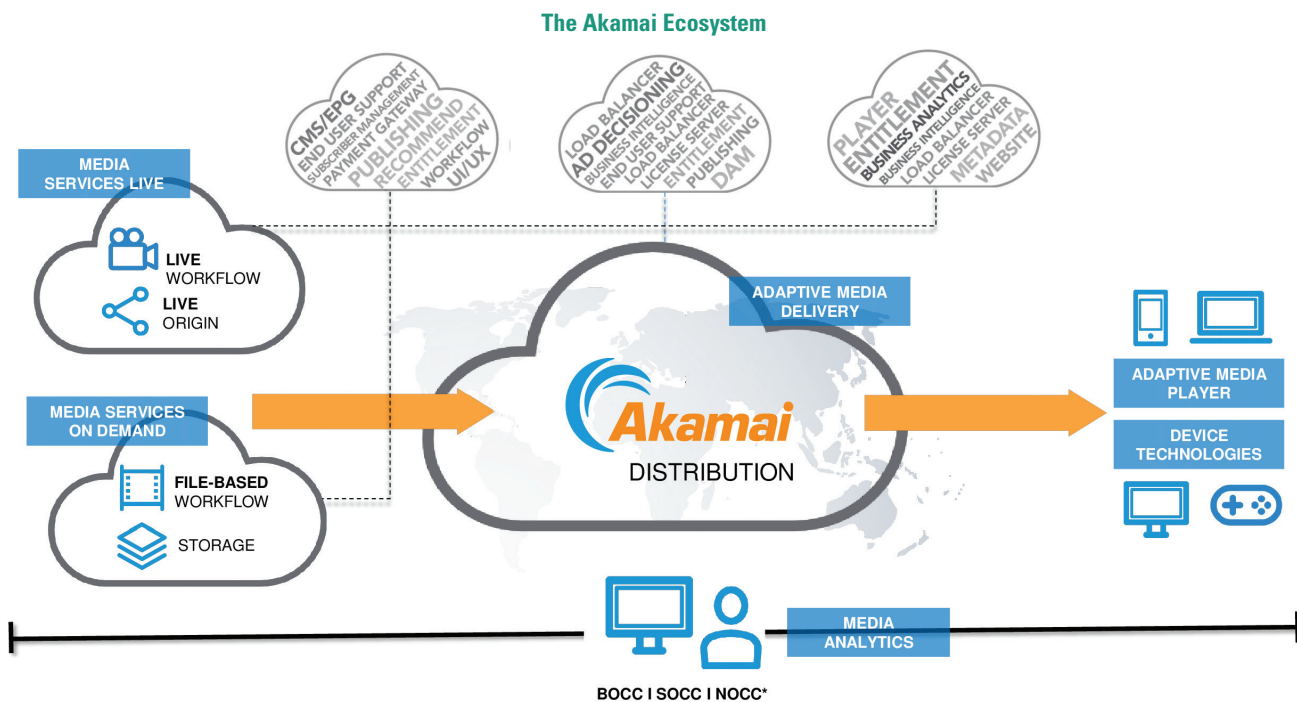
*BOCC is our Broadcast Operations Control Center is managed solution that provides direct access to Akamai media experts who offer hands-on assistance for customers looking to offload (or supplement) proactive monitoring, alerting, live support and mitigation for their OTT video streams.

NOCC is the Network Operation Command Center is a state-of-the-art facility where Akamai monitors the industry's best view of the real-time condition of the Internet. The NOCC is staffed 24 hours a day, 7 days a week by expert network operations personnel.

SOCC is Akamai's Security Operations Center. DDoS protection experts in a security operations center customize defenses and protect customers against DDoS attack types observed as the attack happens.