

# Streaming Media: Challenges, Innovations, and Optimizations in a Rapidly Evolving Landscape

BY SIMON THOMPSON

A wireframe faucet, rendered in a blue and purple mesh, is the central focus. From its spout, a stream of various streaming service logos falls, including Hulu, HBO, Crackle, Amazon Prime Video, CORN TV, AMC, CBS All In, Netflix, and Sling. The background is a dark blue space with a network of glowing nodes and lines, suggesting a digital or data landscape.

**T**he exciting new world of streaming media allows a level of personalization unheard of in linear broadcasting or via traditional cinema distribution, with more accurate recommendations and targeted versions for different devices and viewing habits (e.g., different length news programs for viewers to choose, different raster sizes targeting different display devices or multiple language versions). It allows a far larger range of material from different providers to be delivered to the viewer (both a blessing in terms of diversity of content and a curse in terms of making it all easily navigable), but it also presents challenges. The U.K. government recently highlighted the need to prevent viewers, especially those without high data rate availability, from being left behind.

(<https://www.gov.uk/government/news/media-minister-launches-forum-to-advise-on-the-future-of-uk-television>).

In this issue of the *Motion Imaging Journal*, the papers describe some of the challenges faced and investigate potential solutions and optimizations. Unlike broadcast, the channel data rate availability changes. Streaming, therefore, needs to adapt to a constantly changing distribution channel. Both main formats (DASH and HLS) do this by having multiple quality versions (representations) and allowing the end-user device to switch dynamically. We have several papers looking at optimizing various parts of the streaming workflow:

- A paper from Dolby Laboratories presents a method for analyzing short chunks of content and adapting the encoding parameters to maximize the image quality for a given bitrate. The algorithm used and the effective quality increase are discussed in depth.
- We also have a paper from MediaKind discussing an algorithm to reduce the storage and computation required for multiple representations. This algorithm calculates and stores a single high-quality representation and then calculates difference signals for the other representations needed. Results show the reduction in storage and processing this can provide.
- A separate algorithm that allows dynamic addition and removal of content distribution networks (called “content steering”) is presented by Brightcove, Fraunhofer Institut für Offene Kommunikations Systeme (FOKUS), Akamai and Özyeğin University. The method presented works for both main streaming formats, DASH and HLS, and the results of its load-balancing capabilities are presented.
- A final optimization paper from Ateame and Akamai describes a new algorithm they’ve designed that dynamically adds and removes representations based on audience

demand. By ensuring only the representations needed at a given time are available, the authors calculate the savings in storage and data rate that can be made.

The sustainability of streaming is a hugely important topic. The move from a single high-power transmitter feeding millions of homes to using an IP network with millions of connections needs to be more fully understood. A paper from the French collaborative project SMART-CD describes recent efforts to model the streaming ecosystem, calculate how power usage should be shared among the many concurrent internet users, and present results on power use optimizations, including recommendations on codec choice.

Finally, we have chosen two papers investigating the cutting edge of streaming. The first, a method for streaming 3D volumetric video, is presented by Lucerne University of Applied Sciences and Arts using additions to a current open standard. Secondly, we have a paper from Nokia reporting on new metadata being standardized in the Versatile Video Codec. This allows multiple

video-like streams to be combined into one frame and encoded together, for example, main and ancillary video streams, video and depth maps, or multiple raster sizes.

On a personal note, it was also great to see so many SMPTE members at the Rise Awards, which celebrated Women in Broadcast (<https://risewib.com/rise-awards>). SMPTE President-elect Rich Welsh succeeded in filling the dancefloor with his Disk Jockeying skills (surely, we must see a repeat of this feat at the Media Technology Symposium in its new home in Pasadena). *Herzlichen Glückwunsch* to Dagmar Driesnack, the Director for Europe, the Middle East, Africa, and Central & South America Region, for taking home one of the awards.

#### About the Author



Simon Thompson has worked for BBC R&D for over 20 years, most recently in high dynamic range production. He is a SMPTE Fellow, Standards member, and active in various industry bodies.

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