



# THE FUTURE IS LIVE VIDEO. DO IT RIGHT.

Revolutionizing Live Broadcasts: A Field Engineer's Guide to Mastering Real-Time High Quality Video

By Dr. Gabirel Kerner

The upcoming challenge is one of epic proportions: Winning over new audiences and heralding business models suited for the digital age. In this dynamic era, live video takes center stage. It's not just everywhere; it's interactive, captivating, and immensely rewarding. Live video commands attention, fuels monetization, reaches far and wide, and—above all—makes the experience downright enjoyable.

But live is instantaneous, so, in addition to the challenges of video networking, and the complex mechanisms required to transmit high-quality video, comes a new one — do it with zero delay. When every second counts, time is a very scarce resource, especially when the video stream needs to pass through multiple production, transmission, and adaptation systems before reaching its audience.

Like Heisenberg's uncertainty principle, it has been impossible to ensure both high quality and instantaneous live, until now. Ensuring the quality of video streams incurs delays of, at best, tens of seconds across the contribution and distribution workflows. On the other hand, live video used for example in video conferencing is "good enough" for a talking head over a laptop — but insufferable for an all-important basketball game.

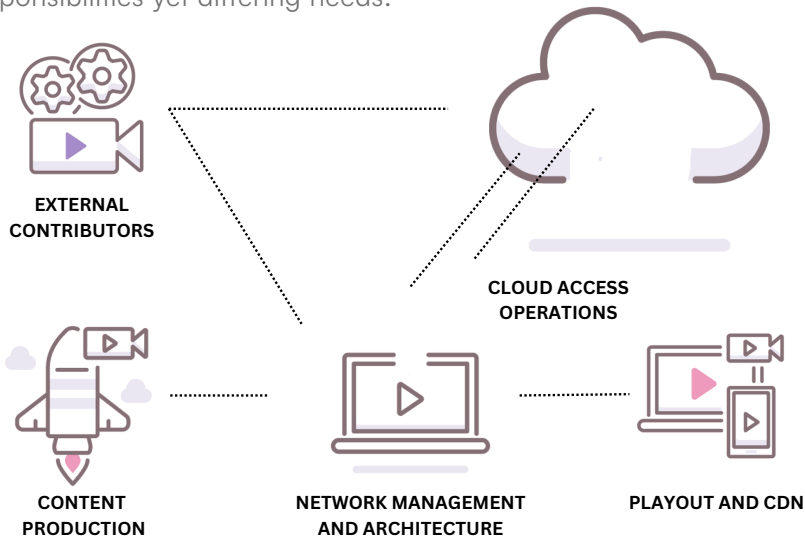
To compound it all - Agility, operational efficiency, and new business models force a new reality: More extensive use of managed external networks, the internet, and even the public cloud.

These beasts are impossible to tame — latency, jitter, packet loss, and reroutes, are only but a few of the never ending challenges this infrastructure is creating. This means first and foremost cost; cost of implementation, management, troubleshooting, and infrastructure. This also means complexity, and with it time — time to resolve problems, time to prepare for a broadcast event, time to integrate ever more complex and less controllable systems and time of video delivery itself - the ever elusive seconds squandered away in buffers and network intricacies.

To navigate the complexities of video over IP networking—its inherent instability and unpredictability—one must adopt a new paradigm—one of network visibility and a single source of truth for monitoring video traffic. The chosen solution must transcend traditional monitoring (looking at IT variables and fail points) and aspire to have true real-time end-to-end active observability and precision analytics to ensure live content is not just delivered, but delivered with excellence. It isn't just about managing your network; it's about mastering it.

The path to making informed, confident decisions that integrates the network infrastructure, optimizes cloud access and operations and unlocks significant costs savings. What's the value of integrated and encompassing network mapping and views, predictive behavior, real-time broadcast monitoring? It's a verifiable and trustable source of video networking information.

When looking at the different aspects of video networking we encounter five key domains, with intertwining responsibilities yet differing needs:



#### CONTENT PRODUCTION

Dynamic Environments, Critical Tests, Time-consuming Complexity, Pre-broadcast Setup, Real-time Adjustments, Adequate Toolsets

#### NETWORK MANAGEMENT AND ARCHITECTURE

Quality of Service, Traffic shaping and management  
Redundant Network Design, Service Provider Management  
Failover Testing, Capacity Planning and Scalability

#### CLOUD ACCESS OPERATIONS

Cloud Complexity, Dynamic Traffic, High Expectations  
Resource Availability, Intercloud Processing,  
Dynamic Networks

#### EXTERNAL CONTRIBUTORS

Lack of Visibility, Responsibility and troubleshooting,  
Quality of Service, Comparability

#### PLAYOUT AND CDN

Multi-distribution mechanisms, Visibility, Cost and  
deployment optimization

### Content production

Broadcasting engineers tasked with setting up a live broadcast, especially in dynamic environments like stadiums or outdoor events, are well aware of the many challenges that come with ensuring a high-quality, stable video stream. The critical tests for connectivity, bandwidth, latency, jitter, packet loss, and route integrity are not just routine steps; they are your assurance to the world that when the lights go on and the cameras roll, complete success is the only acceptable outcome.

However, these tests are time-consuming and complex, involving countless variables and dependencies. They are traditionally performed pre-broadcast, offering no room for real-time adjustments once live. This approach, unfortunately, leaves little flexibility for addressing issues as they arise in this dynamic environment, posing a costly risk to the quality and reliability of the live broadcast. The success of the live event rests in the hands of its engineers. The need tools that are up to the task of recognizing and addressing these challenges.

### Network operations and architecture

In the broader scope of managing the organization's network infrastructure, datacenters, and operation centers, engineering managers and network architects confront a myriad of challenges essential to maintaining high-quality live broadcasting standards. They are required to ensure a robust Quality of Service (QoS) amidst fluctuating network conditions, by building a fail-safe redundant design that guards against unexpected behaviors, and by instituting efficient failover mechanisms to swiftly navigate around network disruptions. Additionally, they are responsible for optimizing the use of resources for peak network performance while managing and coordinating with various vendors and third-party services adds layers of complexity.

Above all, achieving full network visibility to monitor, analyze, and tweak the network in real time to meet stringent SLA requirements presents a significant hurdle. These challenges demand a strategic unified approach and a sophisticated solution.

### Cloud access and operation

When working in the cloud, organizations face multifaceted challenges to successfully deliver live video content, especially in high-stakes environments like live sports broadcasting. These challenges are deeply rooted in the complexities of cloud architecture which, unsurprisingly, are incompatible with the demanding nature of live video traffic, and the stringent expectations for broadcast quality and reliability. Issues such as bandwidth variability, where shared cloud resources lead to unpredictable availability, directly impact the quality of live video streams. Moreover, the inherent latency and jitter associated with cloud services can significantly detract from the real-time delivery essential for live broadcasts. Packet loss is a critical concern, with the intricate network paths in cloud environments heightening the risk of video degradation. Scaling resources to match live broadcast demands without incurring excessive costs poses strategic challenges, requiring sophisticated management strategies. Achieving comprehensive network visibility in such complex architectures proves difficult, complicating efforts to monitor and ensure quality of service effectively. The necessity for rapid failure detection and root cause analysis in distributed cloud services underscores the need for advanced monitoring and diagnostic tools that can shine a light behind the walls of IT and hardware. Additionally, redundancy and reliability mechanisms,

while crucial for maintaining uninterrupted high-quality live broadcasts, incur non-negligible costs and maintenance resources, compounding the challenges for optimizing them at any rate of efficiency.

### External contribution

Delivering high-quality live video from external contributors poses several challenges that stem from the variability in contributors' technical capabilities, network stability, and the complexity of integrating diverse video feeds into a cohesive broadcast

### Playout and CDN

Ensuring seamless integration between playout and broadcasters' workflows, specifically for live broadcasting, introduces a set of unique challenges that are critical to the success of live events and real-time content delivery. These challenges are magnified by the instantaneous nature of live broadcasting, where there is little margin for error, and the audience's expectations for quality and continuity are exceptionally high. Maintaining a high Quality of Service (QoS) and Quality of Experience (QoE) across diverse devices and network conditions, integrating seamlessly with varied production and playout systems, and implementing effective monitoring, analytics, and rapid incident response strategies are essential.

Unsurprisingly, these five aspects intertwine and correlate at the core of the broadcaster's challenge: networks based on Internet Protocol, and the absolute need to transmit video streams flawlessly from source to destination across disparate and often uncontrollable environments. This requires a shift in management principles and operations as video is sent over complex network infrastructures that were not originally designed for the rigors of live video. The critical need for zero-delay transmission, coupled with issues like latency, jitter, and packet loss, underscores the challenge in bridging the gap between our current capabilities and audience's expectations for seamless live experiences.

Addressing these challenges necessitates a holistic understanding of the network architecture integral to live broadcasting.

To thrive in this evolving ecosystem, broadcasters must leverage advanced solutions that offer end-to-end network visibility, predictive analytics, and real-time observability. Embracing these technologies allows for a proactive rather than reactive approach, ensuring that live video content not only reaches its destination but does so with the quality and immediacy that today's audiences demand. This paradigm shift towards mastering the complexities of live video delivery will define the future of broadcasting, enabling content creators to meet and surpass the challenges of the digital age with confidence and strategic insight.



*"Alvalinks offers real-time, continuous monitoring of network performance and paths in hybrid Cloud and On-prem networks. The ability to characterize the networks in terms of key performance metrics allows operational teams to make quick decisions on the best way to utilize their infrastructure and get ahead of any potential network disruptions"*

*Jay Cherian, Solutions Architect, Media and Entertainment, Google Cloud*



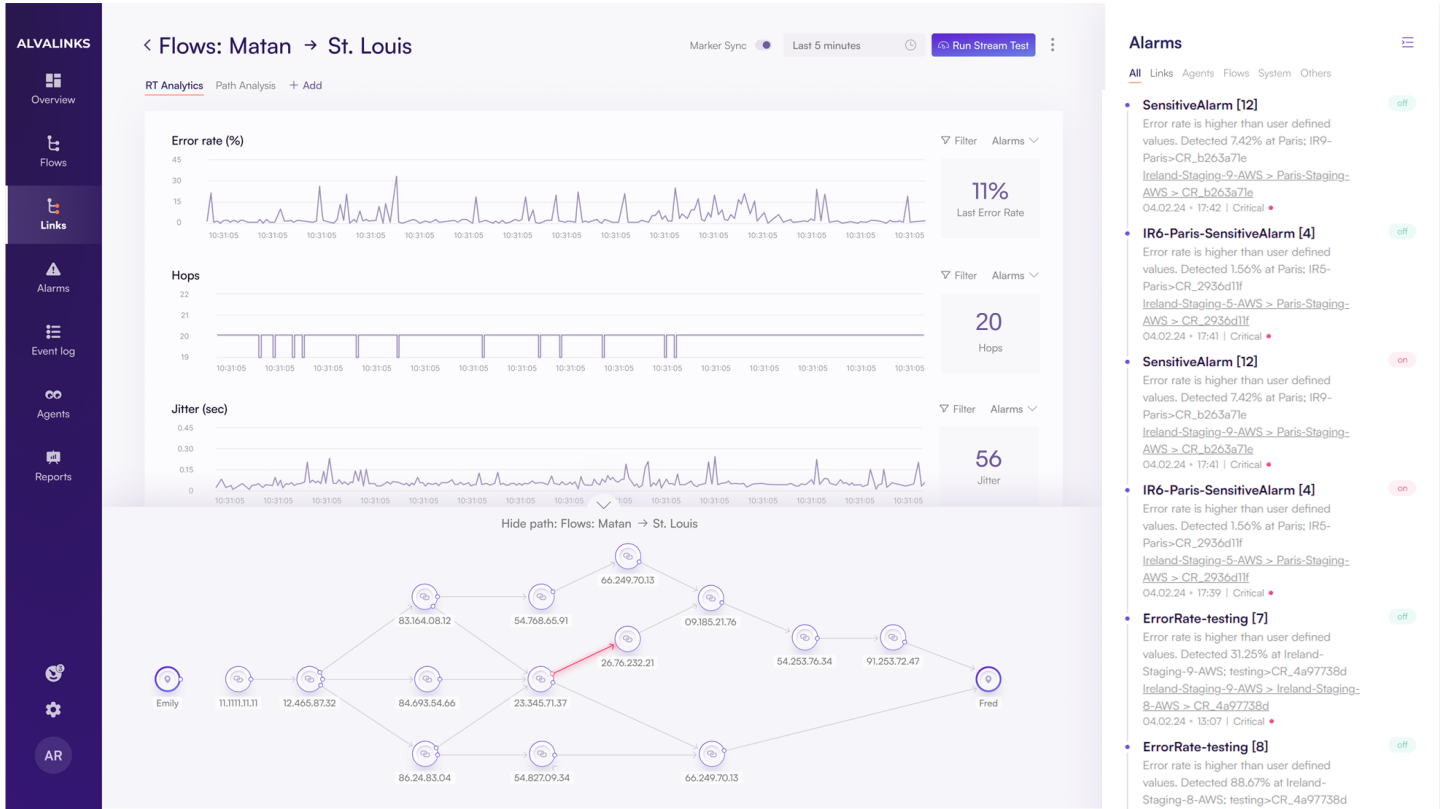
Dr. Gabriel Kerner

At the intersection of value and technology, Gabriel translates complex business needs into coherent solutions. Experienced business leader and networking cloud computing expert, he combines the insight of innovation of with the necessity to bring tangible value. Co-founder of Alvalinks, Gabriel's effort includes to keep the team focused and transform our common vision into powerful business.





AlvaLinks introduces the first true real-time video network observability platform, empowering broadcasters with the agility, operational efficiency, and technological prowess required to overcome the hurdles of modern Live video Networks. Our frictionless approach focuses on end-to-end network visibility, leveraging analytics and real-time monitoring to navigate the intricacies of disparate networks, the internet, and cloud services.



We address the critical pain point of ensuring high-quality, stable live video streams amid the complexities of dynamic environments and IP networking challenges.

Trusted by Industry Leaders:

**"CloudRider technology addressed our visibility issues head-on, giving us the real-time data and historical information we need to understand network behavior and ensure quality of service."**

Ralf Jacob, EVP of Broadcast Operations & Technology, TelevisaUnivision

