Live Streaming the Biggest Sports Events

by Joachim Hengge

It’s the opening match of the world’s biggest soccer tournament, and we’re in a major broadcaster’s video quality control room (QCR). The video feed is launched – from cameras to encoders to network intake to the Internet to viewers and devices across the broadcaster’s home market. As match time approaches, thousands, perhaps millions, of viewers access the stream on their smart TV or laptop. The show is on.

What happens in the QCR then? Either a collective sigh of relief or a mad scramble. The live stream flows flawlessly or there’s troubleshooting and break/fix from the get-go. What determines the difference? Planning, testing, and experience. Technology is imperfect, and the unexpected can always happen, but those three ingredients maximize the chances of success.

Multiply that scene by several dozen broadcast rights holders around the world, and you have a sense of the challenges faced by Akamai’s content delivery platform and technical services staff around global sporting events. We work with each broadcast customer – with its own geography, technology, and audience patterns – to deliver high-quality viewing experiences to their respective audience.

Nothing less will do. When I worked the premier sporting event in London in 2012, large-scale live streaming was at a stage where rebuffering and brief interruptions were sort of tolerated. But as online viewing has exploded in popularity, flawless has become the standard. The audience expects uninterrupted high-definition video. Streaming can’t be allowed to fail today because so many people rely on it as their primary way to view major events. During the recent soccer matches, the Akamai platform served a peak of 9.7 million simultaneous viewers worldwide.

Plan Early

During the 2018 Games in Korea, we were already meeting with broadcasters to discuss plans for 2020 in Tokyo. For these major events, there’s really no break in the action, and you can’t start preparation too early. Preparation is really a process of continuous improvement from one event to the next.
We have to plan the live stream capacity needed by each broadcaster. How many concurrent streams are going to be delivered? For the largest events, it can be more than 50. How large is the anticipated audience, and when will the audience peak? Those answers can be difficult to estimate, but we can count on continued rapid growth of the online audience. Will the live stream be behind a paywall or free to air? That demands scaling your back-end architecture for when viewers are logging in en masse.

We also need to account for the innovations each broadcaster plans for the upcoming event, as these large global events are typically when new technologies are tested or introduced. Transmission in 4K for ultra-high-definition video is becoming common, and the national broadcaster in Japan is already delivering some 8K content. Virtual reality programming and multiscreen viewing are becoming regular features of sports live streams. Broadcasters are actively experimenting and innovating with the online viewer experience because they can do so much more than traditional TV broadcasts.

Our job is to make sure that the Akamai platform is ready with the performance and scale needed to serve the combined audiences of our broadcast customers with the innovations they want to deploy. We have to keep adding capacity and innovating ourselves.

**Test Completely**

One output of the planning cycle should be clear KPIs. Each broadcaster’s technology configuration is different, and each live stream workflow involves multiple hardware, software, and service providers. Those moving parts must be tested individually and collectively against the performance objectives. Thorough testing answers three questions:
• **COMPONENT:** Does each component – video encoders, network ingest points, and so on – work as specified? Once programmed, each component is tested, and the testing routines are saved for regression testing whenever subsequent changes are made. This is standard DevOps practice.

• **INTEGRATION:** Do all the components work together end-to-end as designed? The pitfall with integration testing is getting a good result and then thinking, “Fine, we’re all set.” Components may fail for many reasons, including excessive load. So integration testing must include failover scenarios to keep the stream running when individual components fail.

• **LOAD:** Can the live stream be delivered at the scale needed to serve the peak audience at the designated performance level? Load testing itself requires scale and precision, and too often it gets shortchanged. If the simulated load represents too few viewers coming in from too few points of the compass, you can’t be confident when the event goes live. We can leverage the scale and distribution of the Akamai platform to load test realistically and discover the thresholds of the live stream’s performance.

When we know those thresholds for the live stream workload, we can set up real-time alerts that they’re being approached. We can also optimize the technology configuration to meet the KPIs because we know how good the live stream can be.

I always encourage people to maximize the benefit of whatever testing they do. That means not just asking “Will it work?” but also “How good can it be?” and “What are our specific practical constraints?”

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*Test every component – hardware, software, and service provider – individually and collectively.*
Leverage Experience

No matter how thorough planning and testing have been, something will go wrong. Things can never be perfect when we’re dealing with a variety of technologies, some of them new, and relying on the Internet, the network of various networks. Murphy is always lurking around the corner somewhere.

For example, one broadcaster installed a set of encoders rather close to a tournament start date. Earlier integration testing had gone fine and the live stream looked great, but the encoders in production hadn’t been programmed to send an end-of-stream tag. As a result, the completed match wasn’t immediately stored and accessible for later on-demand viewing. The audience counting on a replay had to wait.

When Murphy’s Law does strike like that, the most important remedy is experience – enough experience not to panic. And it’s collective experience. We work with many of the same broadcaster staff across major events. Together, we capture lessons learned from each event and turn them into best practices for the next. And Akamai learns from the patterns we see across broadcasters with similar workflows. We also work with broadcaster staff to develop playbooks for how to operate the live event stream and how to respond if anything goes awry. Then we practice the plays. Throughout the event, we’re in close communication and coordination online, by phone, or often side by side in the control center.

Going Live

Having invested months, sometimes years, in thorough preparation for live streaming a major sports event, we’d like to have everything in order and a quiet time as the event approaches. But that’s not how the world works. There are always last-minute adjustments, triple-checks, hustling about. And there’s always that moment of tension in the control center when the event stream goes live.

We can’t escape the tension. But with the right combination of planning, testing, and experience, we can face it with confidence. Both confidence that things are highly likely to go well, and confidence that we know what to do if Murphy is in the room.