

Ex Machina Builds Out the Future of Video Streaming by Partnering with Akamai to Enable Ultra-Low Latency, Synchronized Interactivity



Our industry-leading video platform and tools enabled by Akamai allow millions of people to engage and interact in real time while they watch their favorite TV show, event, or live stream, without failure and at a scale that is unsurpassed in the industry."

— Jeroen Elfferich, CEO of Ex Machina

Satisfying an Unmet Market Need

Ex Machina has been building innovative multiscreen solutions and high-profile, cutting-edge apps for brands and media companies around the world. The focus now is on enabling interactivity for end users, with everything from second-screen apps and interactive gaming tools to next-level interactive solutions in the area of shoppable video – all multiplatform and on multiple devices. The latest breakthrough was finding a way to address an unmet need: enabling ultra-low-latency (ULL) and synchronized streaming with interactivity on the same screen.



COMPANY

Ex Machina Group
Amsterdam, the Netherlands
www.exmachinagroup.com

INDUSTRY

Software and Technology

SOLUTIONS

Adaptive Media Delivery
and Media Services Live

KEY IMPACTS

- Enabled ultra-low-latency video at scale
- Realized its vision for synchronized interactive video
- Established the foundation for groundbreaking video applications

Enabling Synchronized ULL Streaming at Scale

"After making second-screen experiences a reality, the idea came to us that the interactivity should be integrated directly into video, in a single interface. We saw the opportunity to offer a streaming solution that scales globally and enables synchronized ultra-low-latency streaming across millions of devices around the globe," says Elfferich.

Ex Machina studied the end-user behavior using a few apps and Twitch extensions launched last year that had live video and interactions. The studies revealed that engaged viewers actively participating in a livestream watch 150% longer than passive viewers. Basic video interactions (e.g., polls) can reach 90% engagement rates. More elaborate gamification can reach 30% to 50% engagement rates. Ex Machina recognized that every video application requiring interactivity can benefit from such a solution – sports broadcasters needing to switch cameras, gaming companies with interactive players, and game shows inviting viewers to chime in with their answers. The applications even extend to a corporate setup, such as to enable interactivity at an all-hands meeting.

"Our generic framework allows us to evolve over time and add revolutionary features and new ways for users to interact."

— Jeroen Elfferich, CEO of Ex Machina

Ex Machina Builds Out the Future of Video Streaming: Akamai Case Study

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With this vision in mind, Ex Machina devised a plan to go beyond streaming video and develop a new solution featuring ULL, synchronicity, and interactive capabilities. It started building a solution to combine the video and interactive layer based on WebRTC, but ran into roadblocks. As Ex Machina Project Manager Jeroen Mol explains, “You cannot beat WebRTC for its speed and real-time capabilities, but it wasn’t built for one-to-many platforms with hundreds of thousands of players and traffic spikes. Moreover, WebRTC requires a dedicated hosting solution, making it less flexible and more expensive.”

Based on its vast experience developing solutions and apps serving thousands of concurrent users, Ex Machina knew it had to satisfy three main requirements for live video streams: the lowest latency, the best video quality, and the lowest price. In addition to being able to quickly ramp from hundreds to thousands of concurrent users and ensuring global availability, the company needed to enable ULL.

Taking Advantage of Akamai’s Unique Differentiators

After investigating the market, Ex Machina decided on using Akamai’s low-latency streaming solution. Akamai has been one of the pioneers when it comes to championing the cause for low latency and the use of Common Media Application Format (CMAF) to achieve low-latency streaming right from its inception back in 2015. Akamai today supports low-latency streaming workflows with chunked transfer encoding CMAF. Ex Machina adopted Akamai’s standards-based, DASH-CMAF approach to enable its ULL interactive video solution. With this approach, Ex Machina was able to overcome the two main issues experienced with WebRTC: accommodating multiple concurrent players and doing it for a significantly lower cost than other ULL streaming solutions.

“Currently, DASH is the best protocol for delivering chunked video. Combining this with CMAF – and pairing it with encoder, CDN, and client behaviors – is what allows the overall system to enable low latency. And because it’s in a single container, we don’t have to worry about the end-user device,” explains Mol.

As Elfferich underscores, “Everyone wants low latency, but it’s also important that the latency is predictable and consistent. Only Akamai’s solution satisfied this requirement.” According to Elfferich, what further sets Akamai apart is that the low-latency video capability utilizes the same edge delivery platform as other media traffic, meaning the benefits of scale and reliability can still be realized for the low-latency video traffic. “We can leverage Akamai’s existing infrastructure. Plus, it’s available at a predictable, reliable price globally that we can pass on to our customers.”

Going to Market with a Groundbreaking Solution

Ex Machina started the rollout of its ULL product, Livery, in the first quarter of 2020, and the product is currently being used by multiple customers globally. Ex Machina is fully compliant with Akamai’s ULL encoder certification. As important as the certification is, the real “wow” factor is when Ex Machina demos its solution. “We show two devices displaying low-latency video and perfectly in sync and then, with the push of a button, we turn it into an interactive experience. Akamai’s drive to evangelize best use cases in ULL innovation gave us the idea to build this; we would not have been able to do this without Akamai,” continues Elfferich.

Akamai’s unique capability to deliver ULL video streams globally – combined with Ex Machina’s ability for video players to maintain a common delay by calculating the latency and adjusting the playback speed – has enabled Ex Machina to deliver synchronized ULL streaming at scale.

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Ex Machina performed tests in multiple countries in order to determine the lowest possible glass-to-glass latency. The goal of the test and the related results were to determine how its production setup performs in different countries. The test was done with the Livery web player on Windows 10 desktops with Chrome as the browser. A 1.0 Mbps DASH livestream was used for the test. The results were recorded after the 30 seconds of playtime. When a rebuffering event or stall occurred or when the buffer went below 30%, the test failed and was restarted with a higher latency target.

The first test included an encoder located in the Netherlands ingesting content into an Akamai entry point in Spain. The following glass-to-glass latencies were recorded: Netherlands (0.43 sec), India (0.84 sec), Canada (0.62 sec), Ukraine (0.71 sec), Vietnam (1.20 sec), Sri Lanka (2.08 sec), Singapore (1.04 sec), Nigeria (2.37 sec), Kenya (1.38 sec), Romania (0.81 sec), and Guatemala (0.73 sec). These values are the average glass-to-glass latency values and include 0.06 seconds added by the Ex Machina encoder hardware.

The second test measured the latency and correlated it to an acceptable streaming quality. A 1080p video with a bitrate of 1.5 Mbps and an audio track of 96 kbps was used during the 30-minute test. The ingest location was in Amsterdam, the Netherlands, and a total of 80 tests were performed in 13 countries. The tests were performed with iOS, Android, and web players all connected with ethernet, 4G, or Wi-Fi connections and glass-to-glass latency of 1-3 seconds.

The streaming quality was defined as the rebuffering percentage – ratio of the total time of stall to the total session time, and a rebuffer percentage of <1% is considered to be good quality for a low-latency stream.

Test Result: Ten of the 13 countries had a rebuffering percentage of <1% with a latency value of 2 or 3 seconds. Detailed results are in the table below.

Regional Rebuffering with Latency Value of 2 or 3 Seconds

COUNTRY	AVG. STALLS PER USER	AVG. REBUFFER PER USER
United States	3.6	0.39%
Canada	9.2	0.65%
Netherlands	1.1	0.06%
Germany	1.0	0.06%
India	11.6	0.51%
France	1.0	0.01%
United Kingdom	7.2	0.65%
Russia	2.7	0.15%
Japan	2.1	0.80%
Italy	5.0	0.11%

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Countries closer to the ingest location were able to stream with a glass-to-glass latency setting of 1 second and a rebuffer percentage of less than 1%. Only for India was the streaming quality slightly higher than the acceptable rebuffer percentage. Detailed results are in the table below.

Regional Rebuffering with Latency Value of 1 Second			
COUNTRY	AVG. STALLS PER USER	AVG. REBUFFER PER USER	
United Kingdom	3.0	0.06%	
France	0.9	0.07%	
Netherlands	1.5	0.07%	
India	32.0	1.44%	

The performance split (rebuffering percentage) across the iOS, Android, and web clients for glass-to-glass latency of 1-3 seconds indicated that, apart from a few outliers (indicated by the cells highlighted in blue), the streaming quality was good at the low-latency levels. The table below shows the breakup of performance against the low latency values for the respective clients.

Rebuffering Split by Device Type with Latency Value of 1-3 Seconds			
DEVICE TYPE	LATENCY: 3 SEC	LATENCY: 2 SEC	LATENCY: 1 SEC
iOS	0.63%	0.88%	1.49%
Android	0.34%	0.73%	1.86%
Web	0.86%	1.30%	11.33%

Mol further explains: “With the traditional DASH approach, latency could be reduced by reducing the segment size. With a segment size of 1 second, a glass-to-glass latency of 4-5 seconds can be achieved. When we started out with ULL-CMAF based on video chunks, we were able to achieve a glass-to-glass latency of 2.61 seconds in the Netherlands. Last year’s optimization allowed us to push the limits to 0.43 seconds glass-to-glass in the Netherlands.”

Akamai and Ex Machina have shown that ULL- CMAF is a scalable and cost-effective alternative to WebRTC when targeting glass-to-glass latency of 1-3 seconds.

Ex Machina has launched with multiple customers. “Going forward, we anticipate working with more content owners and distributors, and enabling them to share an interactive narrative at scale while empowering them to take control of their business models,” concludes Elfferich.

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About Ex Machina Group

We develop innovative, interactive solutions for brands, media, and e-commerce companies around the world. Our solutions, concepts, designs, apps, and platforms reach tens of millions of users, powering thousands of hours of interactivity worldwide, and support the world's most versatile, proven platforms for live interactivity. Ex Machina Group is trusted by some of the biggest names in entertainment like Red Bull, ITV, Twitch, FremantleMedia, Microsoft, RTL, Talpa Media, Sony Pictures Television, WinView, and NBC. The company was founded in 2001 with an original focus on multiplayer games for web and mobile. In 2007 we created the first second-screen play-along-apps, and in 2019 we released Livery, our interactive live streaming solution. Today our focus is on interactivity video in the broadest sense, from second-screen apps and interactive gaming tools to next-level interactive solutions in the area of live video, all multiplatform and on multiple devices.

Our activities cover the whole process of creation from strategy and business case through concept and architecture, to design, development, and operations. We understand how the business works from the boardroom to the production floor. Ex Machina Group solutions, concepts, designs, apps, and platforms ensure maximum reach, audience engagement, and new opportunities for growth and profitability. Ex Machina Group is headquartered in Amsterdam (The Netherlands) with offices in Rotterdam (The Netherlands) and Montreal (Canada).



Akamai secures and delivers digital experiences for the world's largest companies. Akamai's intelligent edge platform surrounds everything, from the enterprise to the cloud, so customers and their businesses can be fast, smart, and secure. Top brands globally rely on Akamai to help them realize competitive advantage through agile solutions that extend the power of their multi-cloud architectures. Akamai keeps decisions, apps, and experiences closer to users than anyone – and attacks and threats far away. Akamai's portfolio of edge security, web and mobile performance, enterprise access, and video delivery solutions is supported by unmatched customer service, analytics, and 24/7/365 monitoring. To learn why the world's top brands trust Akamai, visit akamai.com, blogs.akamai.com, or [@Akamai](https://twitter.com/Akamai) on Twitter. You can find our global contact information at akamai.com/locations. Published 05/20.