THE FUTURE OF LIVE STREAMING

Betting, co-viewing, gamification, and the end of TV as we know it.

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62% Of viewers watch sports via traditional pay TV.

Roku

42% Of viewers watch sports via streaming.

Source: Roku and National Research Group, 2021.

Live streaming has untapped potential, which promises to make the viewing experience superior to traditional linear TV.

INTRODUCTION

The early growth of streaming TV was defined by on demand. Today, live streaming, especially live sports, is in the driver's seat.

Viewership has increased as mainstream sports have become more accessible online via vMVPDs, league apps and services like Amazon Fire TV. In fact, 42% of viewers watch sports via streaming, according to Roku.[1] And live streaming dominates ad-supported viewing. In the first half of 2021, 51%[2] of video ad views were delivered in live streams, versus 37%[3] in episodic and 12%[4] in clips. Even the Super Bowl, which brings together the marque sporting event in the U.S. with the best advertising, saw 9% of the audience streaming the game in 2021.[5]

Most of the effort in live streaming sports, news and events has focused on replicating the traditional television experience. The effort has been largely successful, though challenges remain.

Roku says that 75%[6] of sports viewers are satisfied with their streaming experience, only slightly behind the 80%[7] that say the same for traditional pay TV. But to close the gap completely, the streaming industry must tame problems such as video start failures and buffering events. Globally, 1 in 135 videos fail to start when requested, and 1 in 400 video streams are

impacted by buffering.[8] These shortcomings are minor and need to be pushed even lower, but the data illustrates most streaming sessions are indistinguishable from the broadcast experience.

But live streaming has untapped potential, which promises to make the experience far superior to linear television.

This paper looks at the future of live streaming, the challenges in getting there and how technology will deliver a better-than-TV experience.

The five topics covered are:

1. Betting

2. Watching together while apart

3. Gamification

4. Personalized live delivery

5. Revolutionary experiences

BETTING

Betting – an attractive opportunity for sports streamers.

In the three years since the U.S. Supreme Court struck down the federal ban on single-game wagering, there has been a rush of states legalizing betting. Since the Supreme Court allowed states to regulate gambling, 80% of states have legalized betting or have legislation pending.[9]

Betting is a popular pastime among sports enthusiasts. According to the American Gaming Association, people in the U.S. spent over $1.5B on iGaming, including online sports betting, in the first half of 2021.[10] Moreover, it looks like Americans are hungry for more. Nielsen says that 32% of the U.S. population has an interest in sports betting.[11] However, sports fans are much more interested. For example, 46% of NFL fans and 62% of NHL fans are interested in betting.[12]

With so much money and interest in sports betting, it's not surprising that sports streaming services are starting to take an interest. FuboTV is a vMPVD that specializes in sports. It's developing a free-to-play betting platform, has already launched a sportsbook in Iowa, and has the authorization to operate its sportsbook in several other states.[13] David Gandler, fuboTV's CEO, says the service is integrating gambling into its live streaming experience and that subscribers are primed and ready for it. He says the company's customer surveys show:

> 66 99
>
> Of the 30% of our subscribers that watched at least 2 hours of sports on fubo, 30% are willing to participate in free-to-play. That's one. Number two: 20% of our paid subscriber base has already placed a bet, and 22% of our subscriber base is willing to place bets on fubo.[14]
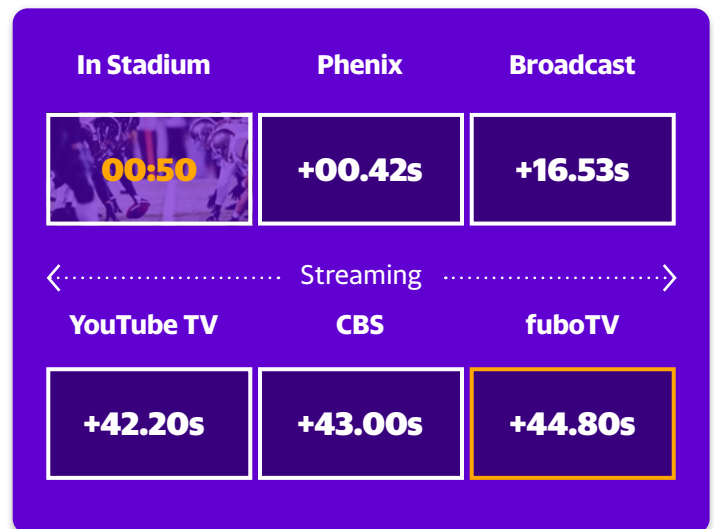>
> **David Gandler**
> CEO, fuboTV

Mr. Gandler thinks fuboTV can secure a substantial share of the expanding sports gambling market. However, to do so, it must meet some stringent technical requirements.

Ultra-low latency is required for betting on live streams.

Nothing will destroy a gambling platform's credibility faster than if bettors believe some people have a technical advantage over others. In other words, everyone must see the action at the same time. For fuboTV, achieving that will be a challenge. Its CBS TV feed of Super Bowl LV was 45 seconds behind the action in the stadium and 30 seconds behind the broadcast feed. Under these circumstances, betting on individual play calls and outcomes would be impossible for a fuboTV streamer.

In Stadium	Phenix	Broadcast
00:50	+00.42s	+16.53s

Streaming

YouTube TV	CBS	fuboTV
+42.20s	+43.00s	+44.80s

The key to a reliable betting experience is ultra-low latency streaming. Betting on the next play becomes viable if the stream is a second or so behind the live action. Standards such as Apple's Low-Latency HLS and WebRTC hold the promise of delivering manageable delays in streaming. However, it will take some time for this technology to roll out at scale. Mr. Gandler is prepared to take things slowly to allow the technology to catch up:

"You start by asking who will win the game? Then you can ask who wins the half? Then you can ask who wins the quarter. Who will win the drive? And so, you can continue to add more and more markets during the game without having to be at zero latency from the first second."

Other technical requirements needed to enable betting.

Low latency is not the only technical challenge to enable sports betting. The laws governing gambling are anything but uniform. For example, in the EU, betting on game results is permitted in Germany, but step across the border into Poland and gambling is illegal. The same patchwork of legislation exists in the U.S. among the 50 states. Online betting is legal in New Mexico, Nevada and Oregon but not across the state line in California.

Any video platform like fuboTV running on a mobile phone must sense the device's exact location. For example, consider someone walking down Lake Tahoe Blvd in Stateline on the Nevada side of town. If they're using fuboTV to place a bet on their phone, fuboTV must block betting if they step across the state line into California, where betting is currently illegal.
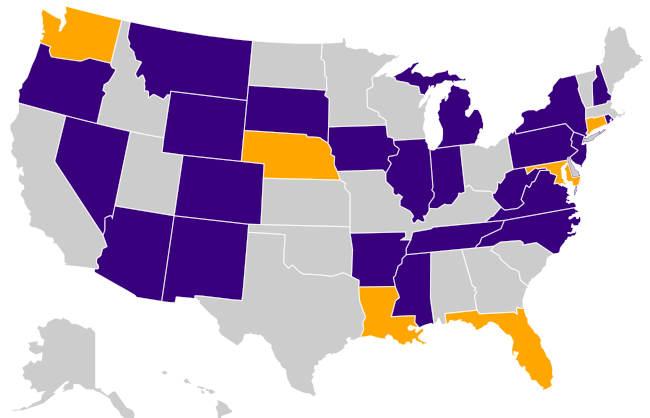
Monthly U.S. Sports Betting and iGaming Revenue

■ Sports betting revenue
■ iGaming revenue

The Legal Status of Betting in the U.S.
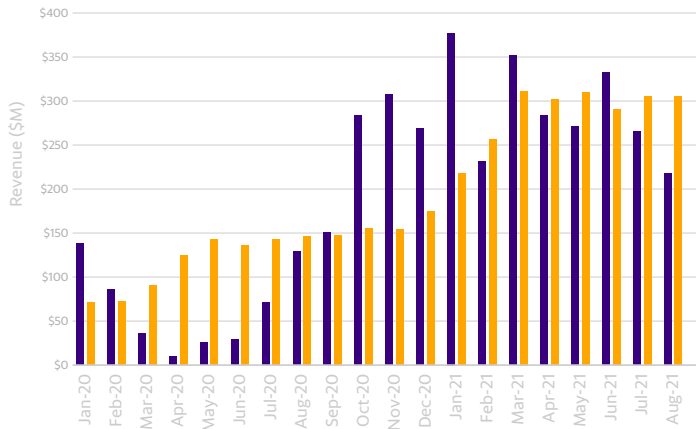
■ Legal
■ Pending

Source: American Gaming Association, 2021.

Source: Legal Sports Report, 2021.

WATCH TOGETHER

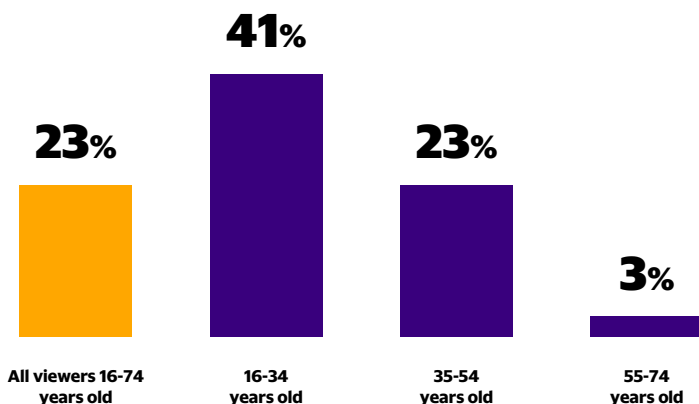## We want to share experiences.

There is no getting away from it; live events are best experienced with friends and family. Even before COVID-19, people wanted to watch events with people far removed from them. In a survey taken immediately before the pandemic, RingDigital found that a quarter of viewers were interested in watching TV with distant friends and family while interacting with them. The number jumped to 39% when asking live sports viewers.[15]

The lockdowns during the pandemic intensified the desire for co-viewing opportunities and afforded people the time to try out different ways of doing it. Hub Entertainment Research found that by the middle of 2021, a quarter of U.S. adults had tried a co-viewing app or service feature. Younger viewers were the most engaged, with 2-in-5 16-to-34-year-olds giving it a try. But a quarter of those 35-to-54-years-old also tried it out.[16]

Service providers reacted quickly to the pandemic, delivering apps and features to support the ability to co-view. Apps like Discord, Metastream and Rave became popular. And providers like Amazon and Disney added support for watch parties to their apps. Disney+'s GroupWatch is typical of the approach. A Disney+ member can start a GroupWatch and invite others to join. Playback is synchronized when the movie plays, and people can chat and throw emojis to the group throughout the experience. According to Disney Streaming Services' SVP of product management, Jerrell Jimerson, the company saw it as an opportunity to allow their members to do what they had always wanted:

> **" "**
>
> Movies and TV shows are by their nature social, and people want to watch them together.[17]
>
> **Jerrell Jimerson**
> SVP of Product Management,
> Disney Streaming Services

Where's the trash talk!

Text and emojis may be acceptable when watching "Frozen" or the latest Marvel movie, but they don't cut it when watching sports. Nothing beats seeing the look on your U.C. Berkeley friend's face as Stanford University scores a touchdown against them. Unfortunately, most co-viewing solutions don't support seeing and hearing friends while everyone watches the game together.

One solution that allows a group of friends to watch a game and each other simultaneously was delivered by the NFL and Yahoo Sports in 2020. The feature – powered by Edgecast[18] - launched with the opening game of the 2020 season between the Kansas City Chiefs and Houston Oilers.[19] Using their smartphones, a group of friends can watch and hear the game and each other simultaneously. All the streams are synchronized, so everyone sees the same thing at the same time. All that's missing are the high-fives on a big play!

Ever Used Co-Viewing Apps by Age

People in TV HHs, 2021

23% All viewers 16-74 years old	**41%** 16-34 years old
23% 35-54 years old	**3%** 55-74 years old

Source: "Evolution of the TV Set 2021," Hub Entertainment Research, LLC.
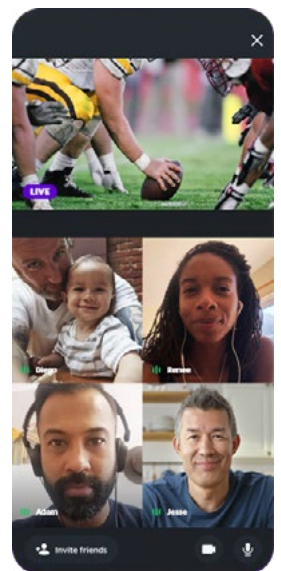
GAMIFICATION

How gamification can be used in live streams.

The idea of using gaming techniques to boost engagement with TV is nothing new. In the '90s and '00s, technology companies like Liberate and OpenTV worked with pay-TV operators like Comcast and Sky UK to gamify broadcast television. Attention focused on pop-up polls and quizzes, nudging people to request more information from ads and ordering pizzas. Sky UK rolled out the technology across its network but ultimately retired it in 2012.

Why did the broadcast attempts at gamification fail to gain traction? One big strike against the approach was that some interactivity approaches took the viewer away from the show, movie, or event they were watching. With Sky, for example, the viewer was taken to a page to fill out contact details while whatever they were watching continued without them. Viewers quickly learned to ignore the interactive elements for fear of missing out (FOMO) on what they tuned in to watch.

YouTube has addressed the FOMO issue with its new Brand Extensions ad format for connected TV. The viewer is shown an offer and can send a URL to their phone with one click of the TV remote. They can review the extra information at their leisure, without missing a moment of the action on the television.

One approach to gamification has proven itself successful, both with audiences and operators: betting. Sky UK had great success allowing people to place bets with its interactive system. As has been previously discussed, fuboTV is following in Sky's footsteps.

Another gaming approach finding favor with streaming TV providers is rewarding viewers for watching. For example, Crackle Plus will introduce a rewards program in late 2021.[20] To take advantage of the loyalty program, users must register for Crackle Rewards. Once registered, users earn points while watching in the mobile apps. They can redeem the points for rewards such as a day pass for ad-free viewing, Crackle merchandise and downloadable codes to watch movies and shows from Crackle's sister company, Screen Media. There will also be limited-time rewards from partners and an elite program for superfans.

Live streamers can use these gamification approaches to boost engagement, attention to ads and commerce opportunities with their events. And gamification works. Studies show that students learning from gamified content increased retention by 12% and overall performance by 7%.[21]

Students learning from gamified content increased retention and overall performance.

12% Retention

7% Performance
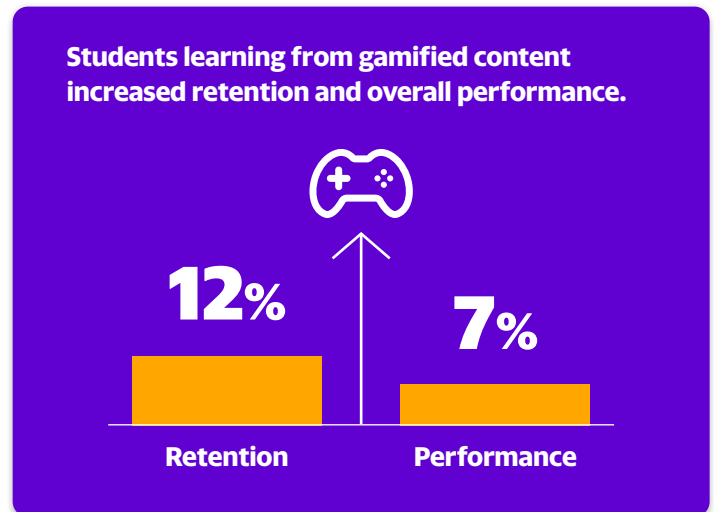
Gamification of live streams requires special attention.

Creating an interactive drama like Netflix's "Black Mirror: Bandersnatch" is one thing, but gamifying a live stream is quite another. Two major technical issues make it particularly challenging.

The first is synchronization between the live stream and video data. Data powers gamification and much of the value is lost if it's out of sync with the video. If a game appears after the action is complete, it's more annoying than engaging! Imagine, for example, a poll asking a football audience if a foul was interference after the next down is complete.

The second issue is ensuring synchronization between what all the viewers of an event see. Features like polls, betting and chat rely on it. Keeping video latency very low – to a second or so – is a great way to handle the problem.

PERSONALIZED LIVE DELIVERY

Multi-sync streams, data and targeted ads personalize live streams.

Broadcast events typically give one view of the action to the audience. In individual sports like Formula 1 or the Tour de France, viewers can become frustrated because they cannot follow a favorite driver or rider. Streaming delivery supports the ability to deliver multiple synchronized streams of video covering different parts of the action.

The F1 app allows subscribers to select the Pro tier to stream the main race feed and add car-cam views of their favorite drivers. It also wraps in synchronized data covering race conditions and specific real-time data on favorite drivers and their cars.[22]

The personalization of a grand prix at this level provides an experience that isn't possible using traditional broadcast technology.

In the section on gamification, we discussed how early interactive advertising failed because it took people away from the action. Another problem with the approach could be the lack of personalization. After all, interactivity does not improve the effectiveness of an irrelevant ad. Consumers like personalized ads, with 43% saying they're important to them, 32% saying they like them, and 30% saying they prefer brands that provide them.[23]

Attaching interactivity to a targeted ad in which the viewer has an interest is much more likely to connect with a viewer and elicit the behavior desired by the advertiser. Showing a diaper ad to young parents is much more likely to result in a click for a coupon than an untargeted approach.

Achieving synchronization and scale is a challenge.

The multi-sync stream approach used by providers like Formula 1 requires two technologies to be successful. The first is low-latency streams. Consumers may like having multiple views of the action but will not use it if their friends spoil the results by tweeting and posting about the action before they see it. The second challenge is to keep all the different stream views of the action synchronized. Again, if switching between streams means a ten or more seconds shift in the action, viewers will not use the feature.

Finally, scaling targeted ad insertion to millions of live viewers is extremely challenging. Filling one ad break with four targeted ads for an individual viewer generates hundreds of transactions between multiple subsystems in a programmatic ad solution. Each of these transactions must be completed within a few seconds for all the ad slots to be correctly filled. Now multiply that by a million or so viewers!

What U.S. Consumers Think About Personalized Ads

Like brands that provide them	30%
Like them	32%
They are important to them	43%
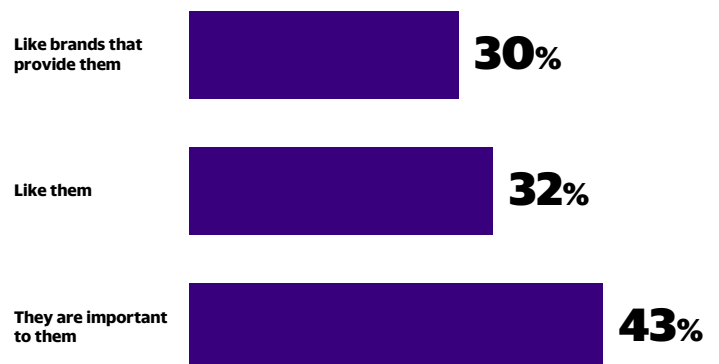
Source: Innovid, 2020.

REVOLUTIONARY EXPERIENCES

VR/AR/XR experiences.

Today, our live video experience is bound to our screens, especially connected TVs. But new technologies are making it possible to think beyond the screen as we know it.

Augmented reality (AR) and virtual reality (VR) exploded onto the media scene in the middle of the last decade. Microsoft HoloLens, Facebook's Oculus, Google Cardboard, and others made great strides in headset technology. Capture and production advances were also made with affordable 360-degree cameras and encoding technology to process the video. Production companies were formed to create VR movies and shows. However, it quickly became clear that what started as a sprint toward AR/VR was, in reality, a marathon.

The good news is that innovation has continued to drive toward solutions capable of delivering extended reality (XR) experiences to the mass market.

Volumetric capture enables XR live experiences.

When watching a live event, we're stuck with a single view of the action based on where the camera is positioned. However, volumetric capture techniques give us the feeling that we can move about inside the event space as if we were there. Volumetric capture uses many cameras positioned around an event venue. AI is used to knit the camera views into a complete 3D video of the venue. A view from any location in the space can be created from the 3D rendering. Duncan East, Head of Directors & Creative, Sky Sports, thinks the technique could revolutionize sports broadcasting:

"You could direct [the sports action] with a joystick."[24]

We can take volumetric capture one step further and create a 3D model of ourselves that moves and interacts with things according to Albert Kim, CEO and Founder of DoubleMe, a company building a platform for creating virtual worlds. It uses volumetric capture to help customers build a virtual world and invite friends to join them there to interact:

"DoubleMe has been working on volumetric video capture…anyone can be instantly captured as a 3D model and popped inside one of the TwinWorlds," said Mr. Kim. TwinWorld brings digital and physical worlds together, empowering users to create virtual selves that share experiences in a virtual world with people globally.

Creating complex live experiences in real time.

The experience can be pushed further into the XR realm using volumetric capture and real-time rendering. Mr. East says that the technology can be used to recreate any event in a sportsman's life:

"As soon as you've scanned somebody, you've got 'em. You can recreate everything they've done."

According to Ali Daniali, Principal Engineer, Immersive Devices & Services, at T-Mobile, you can create situations, locations and experiences for people on the fly, without any preplanning:

> 66 99
>
> Imagine a world where, as you work with your XR wearable, you ask for what you want, and AI writes custom code for you. You receive the application that you want at the time that you need it. Imagine a firefighter needs to gain access to trapped individuals. They need to interact with a new building management system, 3D architectural diagrams and live security video feeds for object detection. AI would access the building management system, project a digital twin of several rescue paths, all by understanding hundreds of APIs. You don't care. The AI knows it, learned from billions of lines of code, writes what you need in a spatial-aware language, and then renders it at the edge, streamed to you immediately.[25]
>
> **Ali Daniali**
> Principal Engineer, Immersive
> Engineering & Experiences,
> T-Mobile

The death of the TV.

To render these XR experiences in real time requires a lot of processing power. Far too much for the existing compute power available in smartphones and VR/AR glasses. However, cloud and CDN providers are busy building out advanced edge networks to handle the load. As 5G networks are built out, our mobile devices will connect to these edge compute resources with high bandwidth, low-latency connections.

With so much computing power available at the network edge, will there be any need to carry a smartphone anymore? According to Mr. Kim of DoubleMe, AR glasses may take their place sooner than you may think:

> ❝ ❞
>
> Next year and the following year will be laying out the foundation. And after that, more casual devices will be populating the whole market. So, about three years.
>
> **Albert Kim**
> CEO and Founder, DoubleMe

Moreover, if the smartphone screen disappears from our lives, can the television be far behind?
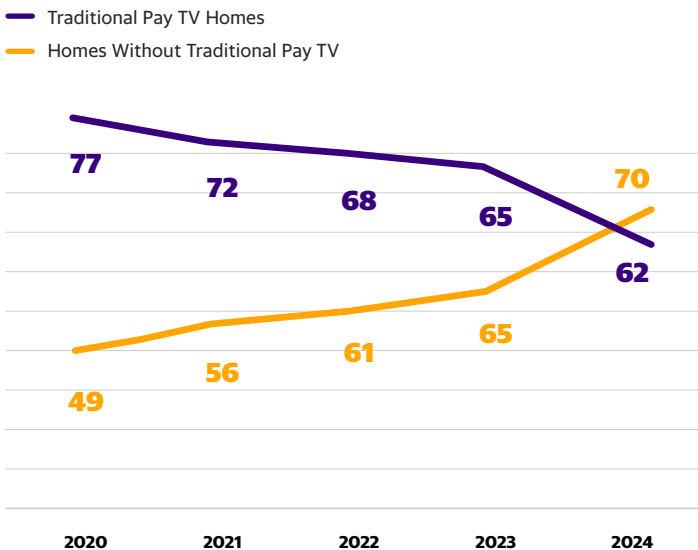
CONCLUSION

Today, premium sports leagues remain aligned behind traditional TV delivery.

There is some logic to this with 72 million cable, satellite and telco TV homes in the U.S.[26] However, there are 56 million homes without a traditional pay-TV subscription.[27] By 2024, there will be eight million more homes without pay-TV than with it.[28] Sports and event broadcasters can no longer rely on traditional TV to reach their audiences.

U.S. Homes With and Without Traditional Pay TV

Forecast 2020-2024 (millions)

— Traditional Pay TV Homes
— Homes Without Traditional Pay TV

Traditional Pay TV Homes: 77 (2020), 72 (2021), 68 (2022), 65 (2023), 62 (2024)
Homes Without Traditional Pay TV: 49 (2020), 56 (2021), 61 (2022), 65 (2023), 70 (2024)

| 2020 | 2021 | 2022 | 2023 | 2024 |

Source: nScreenMedia based on data from Leichtman Research and Nielsen.

Signs are that sports leagues recognize they need to rely more on live streaming. David Proper, Executive Vice President of Media Strategy and Distribution at the NHL, says the hockey league needs to embrace digital delivery:

"Rather than holding tight to a model of linear TV exclusively, we need to be in the digital space in a meaningful way to fully serve our fans."[29]

And where the leagues go, sports broadcasters are sure to follow. ESPN Chairman Jimmy Pitaro promised earlier this year that:

"We'll continue to follow the fan and be there for the fan. As they turn more to digital and direct-to-consumer platforms, we'll evolve as well."[30]

He followed through on his promise with Disney's recent agreement with the NFL. Disney won the right to live stream all the games carried by its broadcast networks via ESPN+.

As premium sports join the streaming universe, they will help drive innovation and bring large audiences to enjoy them. For example, Mark Lazarus, Chairman of Television and Streaming at NBCUniversal, is committed to taking full advantage of streaming technology to innovate the streaming Olympics experience:

> ❝ ❞
>
> Essentially, we plan to use every technology known today or to be invented between now and the 2032 Summer Olympics. That gives us the ability to try new things and to experiment. That's what we'll be doing across the platforms.[31]
>
> **Mark Lazarus**
> Chairman of Television and Streaming, NBCUniversal

With the participation of sports rights holders and aggregators like ESPN and NBCUniversal, the drive to make the live streaming experience more personalized and engaging will gather pace.

Improve your future with live streaming

Learn how Edgecast can help you connect with live streaming viewers easily, efficiently and securely at scale.

Let's connect

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