



GSMA 5G TRANSFORMATION HUB

The world's most innovative 5G solutions



How 5G lowers the barriers for live broadcasts

5G connectivity could enable live event broadcasters to cut production costs by 90%

At live events, 5G connectivity is enabling broadcasters to perform production off-site, radically cutting staffing and travelling costs. Mobile operators' 5G networks enable multiple cameras to stream high definition footage to remote producers in real-time.



How 5G can boost industrial productivity

CASE STUDY LEAD: TVU NETWORKS

+ CHALLENGE

 Prior to the rollout of 5G, many cellular networks didn't have sufficient bandwidth in the uplink to meet the needs of broadcasters looking to enable remote production.

+ SOLUTION

 Broadcasters can use portable 5G transmitters or 5G mobile phones to relay live video images to TVU's servers in the cloud. Accessible from anywhere with a connection, this footage can be immediately produced for live broadcast. Multiple producers can work on multiple video streams simultaneously, giving viewers a choice of camera angles and perspectives.

+ IMPACT & STATISTICS

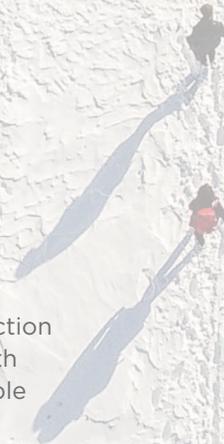
 As 5G connectivity enables broadcasters to produce live coverage remotely, they could lower their production costs by as much as 90%, according to TVU's estimates. As it will no longer need to deploy teams of people on-site at each live event, the global media industry could ultimately save billions of dollars each year, while making it feasible to produce a much wider range of live content.

+ WIDER IMPLICATIONS

 By dramatically reducing the production costs associated with live broadcasts, 5G can enable the coverage of many more events, ranging from amateur dramatics to adventure sports and music festivals. That can help meet the rising demand for access to a much wider selection of content that helps satisfy consumers' expanding tastes and interests.

+ STAKEHOLDERS

 TVU Networks



SOURCES & FURTHER INFORMATION



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How 5G lowers the barriers for live broadcasts

In the summer of 2021, a large U.S. media company covered a major sports event just using 5G mobile phones. Employing a solution developed by TVU Networks, the phones streamed live high definition footage to a TVU server in the cloud where it was immediately accessible to the producers.

Rather than using conventional camera angles, the media company gave viewers a pitch-side view, as if they had front row seats. The mobile phones were mounted on gimbals to keep the images stable. "It was such good production quality, most people did not believe that it was done with phones and a cloud infrastructure," recalls Paul Shen, CEO of TVU Networks. "It was quite a phenomenal production. It was amazing."

The media company employing the 5G phones is one of more than 1,000 TVU customers using 5G to capture live video feeds. "We have above 75% of North American broadcasters using 5G," says Paul Shen. "In China it is also widely deployed, with about 85% of the provincial TV stations using 5G technologies. There has been very quick adoption."

TVU says customers in South Korea, Japan, France and parts of Africa are also now using 5G technology to support the remote production of live broadcasts. Today, all of TVU's portable transmission and encoding equipment is 5G-enabled or a customer can simply use 5G mobile phones to connect to TVU's servers in the cloud.

Although there are still some parts of the world where TVU continues to use 4G, it expects a quick transition to 5G as coverage spreads globally and 5G handsets are deployed.



"The low latency and high throughput of 5G is huge for remote production," as it enables video footage to be streamed from multiple cameras in real time, says Paul Shen. "In the past, we have used multiple 4G LTE carriers together and we are able to address HD for a single signal transmission. But you need a significant aggregation, or multiple LTE connections, to achieve the bandwidth that 5G can deliver."

At the Winter Games in Beijing in 2022, TVU says its broadcast customers transmitted more than 7,600 GB of data as they covered the event. Many of the 100 plus broadcasters using TVU's services employed China's 5G networks.

As well as delivering the required uplink bandwidth, 5G networks can meet the latency needs of broadcasters. "In the past, to have video instant replay, you would need to have a professional managing it on-site," explains Paul Shen. "But now everything is in the cloud and your interface is on a mobile device. For instant replay and interaction, ultra low latency is important. It also requires a lot of bandwidth because we have multiple cameras looking and listening."

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Paul Shen - CEO of TVU Networks.



Dramatically cutting production costs

Over the past two years, 5G-enabled remote production has provided a means to cost-effectively create high quality content, while also overcoming pandemic-related travel and social-distancing restrictions. By reducing labour and travelling costs, remote production can offer major financial savings. “We are talking about maybe even one tenth of what the traditional cost would have been, even more,” says Paul Shen. “The reason is, without remote production, you have to have all the people from the camera crew, the production crew, including a producer, a video engineer, an audio engineer and announcers, all on site. But now we have seen customers do a full production with everyone sitting at home, in various different locations. On site, you don’t need any heavy equipment.”

Today, media companies around the world spend billions of dollars each year on the production of both live events and recorded programmes. Employing 5G to streamline that process would enable that money to go much, much further. “Rather than taking a few days to do a production, you can do several productions in a day,” says Paul Shen.

As 5G-enabled remote production becomes widespread and costs fall, the live broadcast market is likely to expand further still. The dramatic reduction in costs will make it easier for semi-professional and amateur organizations to broadcast live coverage of sports fixtures, concerts, festivals and other events. By using 5G to capture live video streams from multiple



cameras, amateurs will be able to produce a broadcast of a much higher quality than has been possible in the past.

There is growing demand for more diverse content, as people increasingly watch videos-on-demand on their mobile devices, rather than traditional television. “The media industry is being forced to change rapidly,” observes Paul Shen. “Once people begin to have the device at their fingertips, the content demand is very different from the traditional format TV. The traditional high-expense production cost cannot sustain the business, because the market demands much more content than what [traditional broadcasters] can deliver today.” Fortunately, 5G-enabled remote production is making it financially viable to produce the diversity of content required to meet this new form of media consumption. “Otherwise they couldn’t do it,” says Paul Shen.

“The socio-economic impact is huge,” he adds. “We see high school students do very high quality sports event productions just with phone cameras.” For broadcasters that can afford to hire professional producers, they may only need to pay for a few hours of their time because they can work from home.

At the same time, 5G-enabled remote production makes it easier for media companies to offer viewers a choice of camera angles at a live sports event, for example. “In the past, everyone was watching the same feed even though there were 30 plus cameras,” says Paul Shen. “When it is 5G-enabled, multiple people can do simultaneous production in the cloud. It is now possible to do creative production from multiple different angles, serving people’s different interests.”



Working with mobile operators to customize connectivity

TVU has forged partnerships with mobile operators, often bundling cellular connectivity into the package it provides to customers. It works with operators all over the world, including China Unicom, China Mobile, AT&T, Sprint, T-Mobile US, Telefónica and Vodafone.

“We are one of the major customers or resellers of carrier services,” explains Paul Shen. “We want to provide reliable transmission, so historically, our equipment would often rely on multiple SIMs, so they can use a different cell tower, but also different operators, because [individual] operators were not able to give us in the past the level of reliability we wanted to be able to achieve.” But with 5G, TVU can now offer clients “a higher priority service” for a small increase in the price of the connectivity.

In some cases, TVU works with individual mobile operators to trial new propositions. In Portugal, for example, AV supplier Ibertelco, mobile operator NOS and TVU have tested the use of 5G to help cover football matches at the

Estádio da Luz and Estádio José Alvalade. In addition to its typical 18-camera coverage, Benfica TV added seven 5G feeds to a May 2021 broadcast of a match between SL Benfica and FC Porto.

The 5G cameras were placed in areas not accessible with manned, wired cameras, such as near the goal netting, a walkway at the top of the stadium, the tunnel from the locker rooms to the field, and beside player benches. Four TVU One 5G mobile transmitters and three 5G mobile phones with the TVU Anywhere app were used to deliver high-quality, low latency video from the field to four dual-channel TVU transceivers at an outside broadcast van on site. From there the signals were streamed and broadcast to viewers across the globe.

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During a subsequent game in which Sporting CP became league champions, Portuguese broadcaster TVI used NOS 5G to enable a holographic player interview. The holographic image of Sporting CP captain Sebastian Coates was sent via a TVU One 5G device to a TVU transceiver at the TVI studio after his team's win. From the studio, a TVI host conducted a live interview with the hologram version of Coates.

"With 5G, our network capacity can handle a far greater volume of data within the stadium, allowing us to offer a superior experience to fans in the stands and those watching from home," said Felipe Montesinos Gomes, Head of Sponsorship & Activation, NOS. "Those in the stands can chose the angle from which to see the game or activate one of the broadcast cameras, among other more immersive activities."

TVU also works closely with Qualcomm. In 2018 and 2019, before 5G was widely deployed,

the two companies tested the new connectivity for broadcast-related use cases. "We worked together with them to thoroughly debug the entire transmission channel from the cell tower to the chip," says Paul Shen. "There were some challenges in the early days of the technology as there always is. The way we leverage this infrastructure is very different from a normal cell phone call or internet browsing. We need constant high-speed throughput. This is demanding on infrastructure, as we are pushing a massive amount of data, most of it on the uplink."

By working with Qualcomm, TVU Networks learned a lot about the characteristics of 5G, enabling it to extract the required performance from the technology. "When the 5G services were deployed, our services were ready," Paul Shen added.



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Making the move to 5G mmWave

Today, most of TVU's customers are content to capture footage in full HD (1080p), but some are beginning to broadcast in 4K resolution, which could eventually be superseded by 8K. Paul Shen says 5G in the sub 6 GHz bands can handle 4K by aggregating multiple connections.

As early as 2019, one of South Korea's largest broadcasters, SBS, worked with TVU to broadcast its SBS Super Concert live in 4K using 5G technology. The two-hour event was streamed using a single TVU One 4K unit that was installed inside the venue and connected to two 5G-enabled mobile phones, with 5G bandwidth provided by Korea Telecom. The result was an ultra high-definition live stream of the concert on YouTube.

Today, 5G networks in the sub 6 GHz spectrum bands continue to perform very well for TVU, but it expects them to become much busier in future as demand for 5G rises. For that reason, TVU is likely to make extensive use of 5G millimetre wave (mmWave) connectivity in future.

TVU is already testing 5G mmWave for the transmission of 8K video footage, but is waiting for wider deployment before using it commercially. "We have seen enough of the tests, including 8K transmissions, and they have been phenomenal," says Paul Shen. "Our [5G mmWave] technology is actually ready to go. If it is widely supported, the customer will begin to use it because it brings certain advantages that today's infrastructure cannot deliver."

TVU Networks expects 5G mmWave to be widely deployed

in sports arenas, concert halls and other entertainment venues, where there will be demand for very high capacity connectivity. "That's exactly the scenario that we foresee because when you have a stadium with 20,000 people sitting there, [conventional] network congestion is going to happen," notes Paul Shen.

The production of highly-immersive 360-degree footage, for virtual reality and Metaverse applications, would also benefit from 5G mmWave connectivity. "We have done 360-degree virtual reality transmissions," says Paul

Shen. "To make the Metaverse a reality, you need very low latency and high throughput because with each head movement, you need an ultra fast response. You need a certain resolution to make it meaningful."

TVU is also exploring the potential of edge computing, by testing the AWS Wavelength proposition. "Once you go to edge computing, it's an advantage, as every reduction in latency is always an advantage," says Paul Shen, but he cautions the benefit is unlikely to be as great as that achieved by the transition from 4G to 5G.



About the GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

For more information, please visit the GSMA corporate website at www.gsma.com.

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GSMA 5G Transformation Hub

The GSMA 5G Transformation Hub is an authoritative source of information on some of the most innovative 5G solutions in the world. This portal contains case studies detailing design, benefits, key players, measured value and the future impact of scaling up these 5G solutions worldwide.

The 5G Era is now firmly established and this family of standardised GSM technologies, including mmWave, are being rolled out successfully across the globe. The GSMA 5G Transformation Hub, launched at MWC Barcelona in 2022, provides details of how 5G is best placed to deliver real value for a range of key sectors including manufacturing, energy, transportation, live entertainment, smart cities and construction. We acknowledge the kind support and sponsorship of Qualcomm Technologies with the creation of this case study.

Many more case studies will be added, in the coming months, covering even more industries and the GSMA is asking Members to nominate innovative 5G case studies to add to this global digital showcase.

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