NOVELSAT

BUILDING THE FUTURE OF 5G VIDEO

March 2021

A TSUNAMI OF CHANGE FOR MOBILE AND MEDIA NETWORKS

Are you ready? The mobile, media and entertainment industries are gearing up to experience a massive reimagining of their commercial vistas, driven by the convergence of three megatrends.
Trend one. Proliferation of 5G networks worldwide, enabling ultra-fast speeds and low latency like never before.
Trend two. Video streaming is on the rise with more than 70% of mobile users watching video on their Internet-connected phones (a trend intensified by the global pandemic).
Trend three. Edge computing is emerging as a force, upgrading user experience by bringing instantaneous content closer to audiences.

Since 5G networks are better at supporting mass video streaming and can incorporate MEC (Multiaccess Edge Computing) architectures, 5G will act as a catalyst for Trends two and three.

5G NETWORKS

EDGE COMPUTING

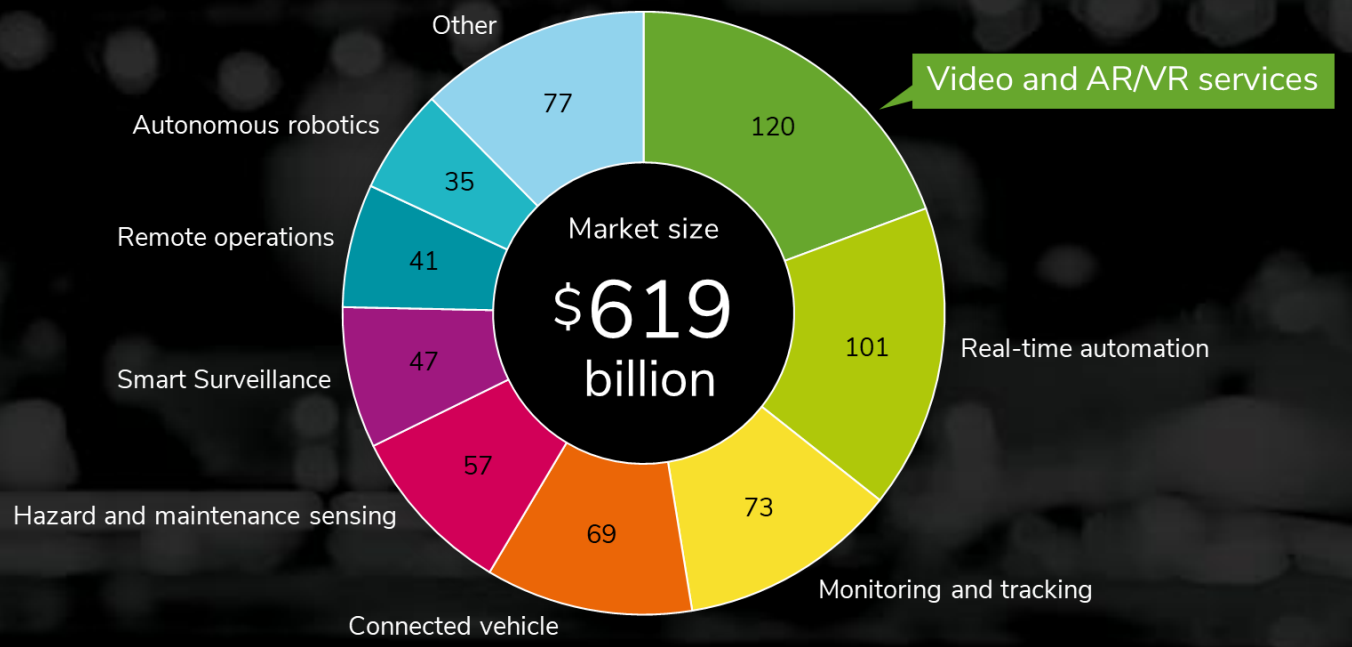
VIDEO STREAMING

ACCELERATED BY 5G

A GOLDMINE OF 5G-ENABLED COMMERCIAL OPPORTUNITY

Super-fast, low-latency, high-bandwidth 5G networks are opening up a wellspring of monetizable opportunities for new technology and legacy players. According to a recent report by Ericsson, the market of 5G-enabled services is valued at over $600 billion dollars, of which Video and AR/VR services will command the lion's share, worth an estimated 120 billion dollars. The size of the opportunity for video may be even bigger. A report commissioned by Intel and conducted by Ovum forecasts that media and entertainment 'experiences' enabled by 5G will generate up to $1.3 trillion in revenue by 2028.

BUSINESS POTENTIAL PER CLUSTER



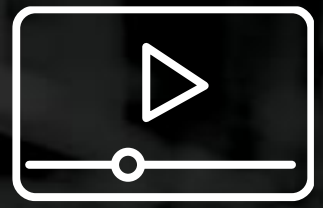
Source: Ericsson, 2020

5G IS TRANSFORMATIVE FOR MEDIA, ENTERTAINMENT AND TELECOM

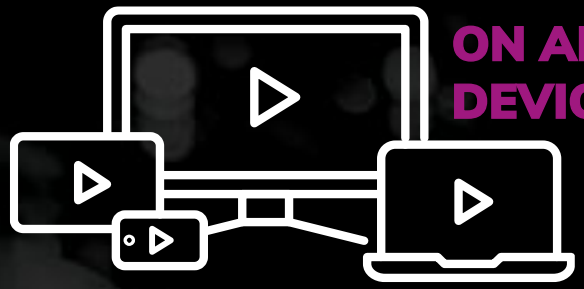
5G is set to become the content-of-the-future distribution network par excellence. By allowing faster-than-ever, low latency delivery of mobile content (100x faster than 4G), 5G will open the floodgates for a new generation of immersive virtual experiences, collaborative viewing, personalised storytelling, and whatever else innovators are dreaming up. Some argue, mobile distribution of video via 5G will reverse the 'decline of television'. Lines are rapidly blurring between entertainment and telecommunications companies, empowering mobile providers to reinvent their business models and tap into new revenue streams.

CONSUMERS WANT THE HOME VIDEO EXPERIENCE, EVERYWHERE

Smartphones are already the first screen for consuming video, and audiences naturally expect the seamless, high-quality, interactive video experience enjoyed on their home TVs to be replicated on their mobile devices. Media and entertainment are moving from the living-room to just about everywhere, and smart companies will meet their audiences wherever they are. But next generation 5G-enabled entertainment will not only be about where customers access video content, or how seamlessly and synchronously (forget lags), it will also be about the intensity of their experience, and the multiple modes of interacting with it. For media and mobile providers, the question is simple: how to deliver the goods?



ALL VIDEO CONTENT



ON ANY DEVICE

BEST QUALITY

FULL CONTROL

LATENCY FREE

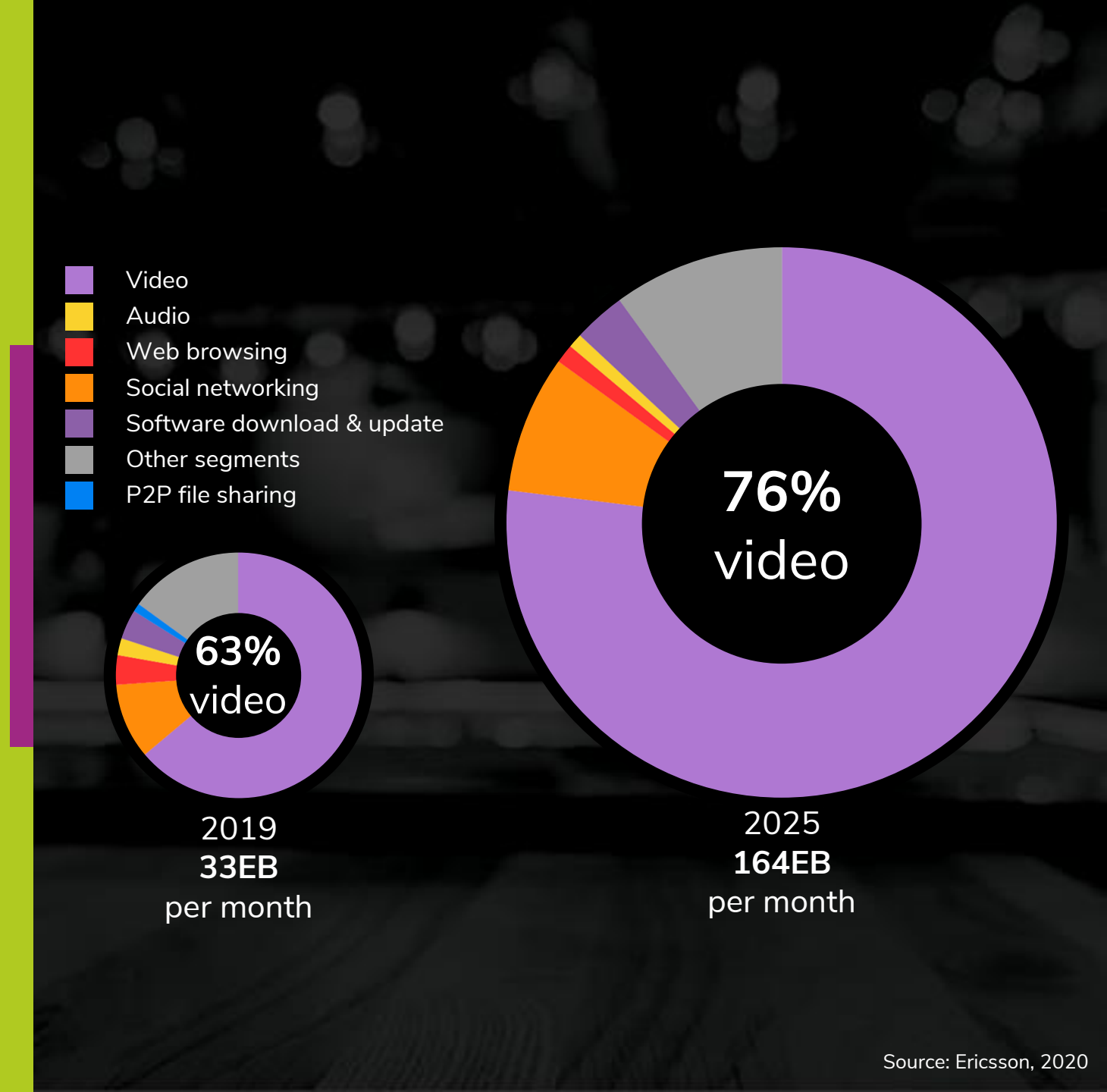
WHEREVER WE ARE

THE HOME VIDEO EXPERIENCE, EVERYWHERE - EXPLAINED

Okay, it's a nice buzzword. But what does it really mean to deliver "home video experience everywhere". Let's unpack it. One. Viewers want profound choice, which means access to all video content, live and on-demand. Two. Naturally, we'd like to consume the video content on any device connected to our cellular network - smartphone, tablet, laptop or even our TV if that is connected via our mobile network. Three. We're not going to settle for anything less than the best possible quality on our devices. If our device can display HD or UHD, we want content played at this quality. Four. We've got used to having total control on streaming and broadcast video - so pause, catch-up and reply is now non-negotiable. Five. We expect as close to a latency-free experience as possible (It's not called latency rage for no reason!). Six. Last but not least, we want to view content anywhere and everywhere – outside or on-the-move, in a car or on a plane - and at all times.

VIDEO IS DOMINATING MOBILE TRAFFIC

Over 70% of mobile users watch video on their mobile phones (a trend intensified by the global pandemic). Mobile traffic is dominated by video and this is set to skyrocket. By 2025, Ericsson forecasts video will account for 76% of mobile traffic (up from 63% in 2019) larger by far than any other service or application. If 3G networks were designed to carry data, and 4G were about data and video, 5G networks will not only become the primary distribution networks for video content, they will enable a totally new world of video experience: immersive and interactive.



Source: Ericsson, 2020

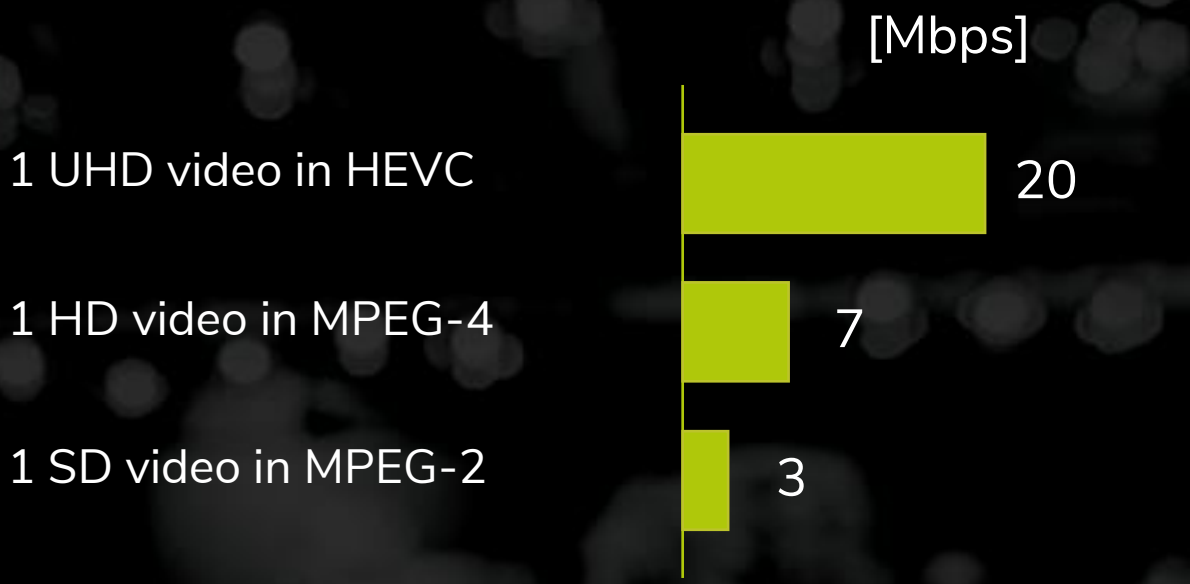
VIDEO IS CONGESTING MOBILE NETWORKS (surprise, surprise)

Today's mobile networks are being strangled by video. Higher video resolutions and new video experiences are congesting bandwidth. Video traffic across mobile networks is exploding because the method used to deliver video over cellular networks is unicast-based, which means every user device requires a dedicated unicast video stream. Further still, backhaul networks have limited capacity - they simply weren't designed to handle this deluge of video. Video isn't data, it's a stream of content which can't be easily multiplexed to clawback efficiency. As video overloads cellular networks, today mobile service providers are faced with the need to invest dearly in a long path of upgrades.

VIDEO BANDWIDTH GROWING

VIDEO TRAFFIC EXPLODING

BACKHAUL NETWORK IS LIMITED



Source: Eutelsat, 2019

VIDEO IS CONSUMING MORE AND MORE BANDWIDTH

Bandwidth issues are only going to become more severe for mobile operators. Here's why. A single Standard Definition (SD) video stream compressed in MPEG-2 consumes about 3 Mbps of bandwidth. When we go to High Definition (HD) streams, even though it uses better video compression of MPEG-4, it still consumes 7 Mbps of bandwidth. And, when we go to Ultra-high Definition (UHD), like 4K video stream, which uses very high efficiency video compression (HEVC), bandwidth consumption is up to 20 Mbps. Quality is a moving feast. SD quickly became HD, today more and more content is 4K, and 8K content will be here in the blink of an eye.

VIDEO EXPERIENCES ARE SET TO BECOME MORE IMMERSIVE

From being a spectator of a live sports event or of a concert performance, entertainment is rapidly transitioning from being about content we merely watch to being about an experience we are fully immersed and involved in. Immersive video experiences are also going to place unprecedented demands on network bandwidth. Multiview, 360 video, 3D video and Virtual Reality all require much higher bandwidth than standard video streams. Each of these immersive video services will need significantly more than 20 Mbps per channel, surpassing even 4K video bandwidth.

MULTIVIEW

360°

3D

VR

5G-ENABLED TVS ARE COMING TO A NETWORK NEAR YOU

Mobile devices are not the only ones invited to the 5G party. We are seeing the emergence of 5G-enabled fixed devices like TVs. New offerings from Huawei or Samsung are already shipping with built-in 5G SIM cards to enable content to be consumed directly from the mobile network without the need for any terrestrial connection or streamer. Large screen TVs that offer viewing content in HD, 4K and even 8K will require exponential bandwidth (as seen in this example from Huawei). An 8K TV displaying 8K content requires over 160 Mbps from the 5G network! That's heavy.

HUAWEI

Huawei to launch world's first 5G-enabled 8K TV

SAMSUNG

SK Telecom and Samsung Electronics Join Forces to Realize 8K TV Powered by 5G Network

SK

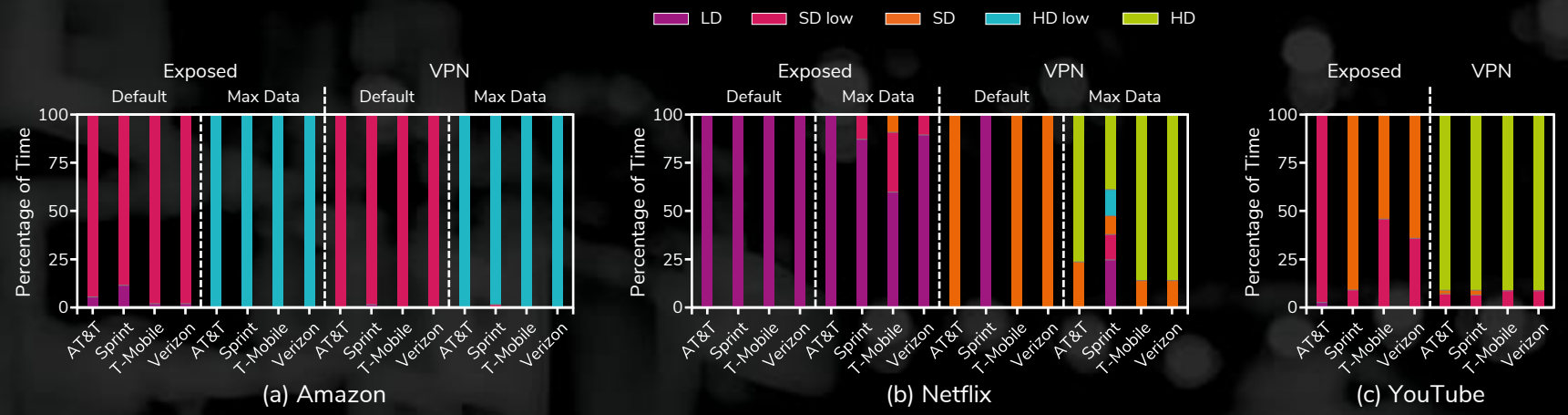
"The 5G-8K TV is the culmination of ultra-low latency 5G networks combined with ultra-high definition TV technology. 5G technology will help make the world of hyper media a reality."

Park Jin-hyo, CTO and Head of ICT R&D Center at SK Telecom, Sep. 2019

Image Source: T-Mobile

THE FUTURE OF TV IS 5G

The whole media landscape is changing before our eyes. Who would have predicted a few years ago the Golden Globes would be dominated by winners from OTT companies like Netflix and Amazon? Now mobile network operators are eyeing the TV broadcast segment, looking to become broadcasters too and providing subscribers with the video and TV experiences until now only available from cable or satellite service providers. It's no pipedream either. 5G's ability to deliver high amounts of data and video means this valuable business opportunity is now well within reach. Thanks to 5G, more and more MNOs will soon be able to offer TV services to their subscribers. In fact, it's already begun.



US Example

Source: Northeastern University and University of Massachusetts Amherst, 2019

>650,000 tests from early 2018 to early 2019
iOS and Android devices capable of displaying content in HD

Decreased video quality

only **4%** playback at max bitrate

NETWORKS THROTTLE VIDEO STREAMING (and User Experience!)

But there's a catch. What good will all this amazing 4K, immersive, live-streamed, interactive video be if it gets stuck in slow network traffic jams.

Even at present, mobile networks cannot cope and are throttling down video quality, frustrating subscribers (so much for a home video experience, everywhere!). As seen in the chart, recent test data from the US reveals that in most cases video content was displayed on the user devices at Low Definition (LD), Standard Definition (SD) low, or SD - even when the original content was at HD quality and the user devices (iOS and Android) were capable of displaying HD content. Even when hidden inside a VPN, video content was still throttled down to a lower quality in most cases. It's not a one-off phenomenon. According to Qualcomm, only 4% of video delivered on mobile networks is actually played at the maximum bitrate possible.

IT'S ALL ABOUT BACKHAUL CONNECTIONS

That's why it's all about the backend. Mobile networks are as good as the backhaul connections that connect cell sites and base stations to the core network. And these connections are just too narrow. A recent report from Ericsson reveals that while the typical capacity of urban, suburban and rural backhaul connections may be sufficient for broadband connectivity, they are far from sufficient for quality video delivery. Since today video is delivered as a unicast stream, just a few users consuming HD video is all it takes for most of the backhaul bandwidth to be consumed. Leaving zilch bandwidth for broadband connectivity! To deliver on the promise of quality video delivery to all subscribers, backhaul capacities need a major upgrade. Which means a major financial investment.

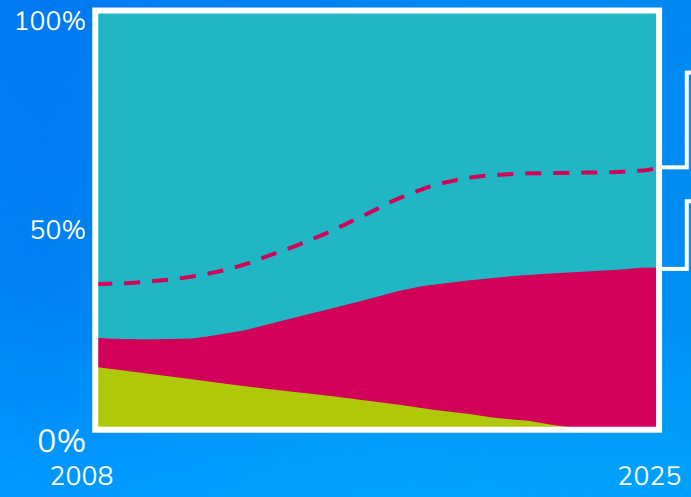
BACKHAUL CAPACITY PER END SITE - 2020

Urban	250Mbps – 1Gbps
Suburban	100Mbps – 500Mbps
Rural	50Mbps – 150Mbps

Source: Ericsson, 2020

BACKHAUL IS NOT ALL FIBER (what a pity)

You may be thinking, what about fiber optics? Herein lies another challenge to the backhaul network. Microwave is today the dominant backhaul technology and is likely to remain so for the near future - accounting for ~70% of mobile backhaul connections globally (excluding north east Asia). Microwave poses further limitations on video delivery due to the limited capacities it enables versus fiber. Furthermore, upgrading microwave backhaul connections to support video delivery requirements are neither simple nor cheap. And it's going to be years before fiber takes its place.

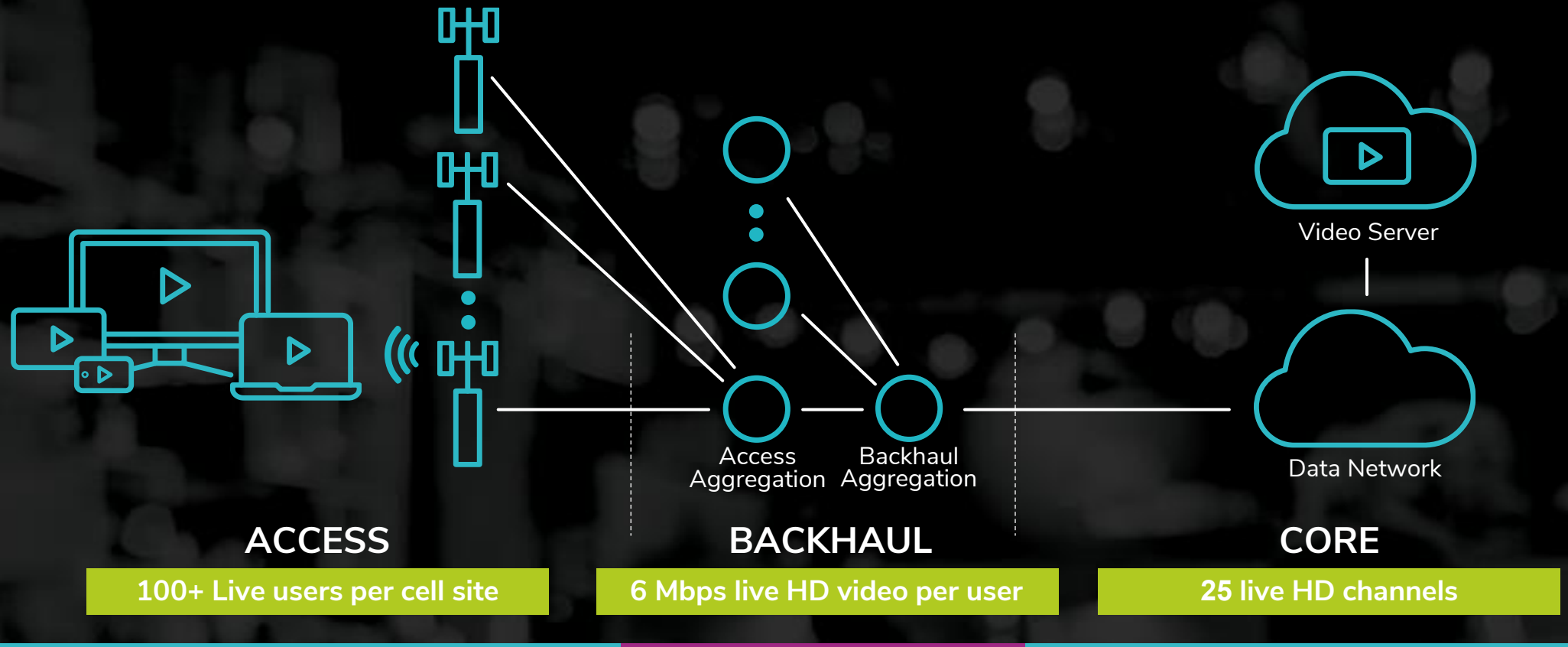


~38%
of radio sites globally will be connected via microwave by 2025.

~62%
of all radio sites will be connected via microwave by 2025 (excluding North East Asia).

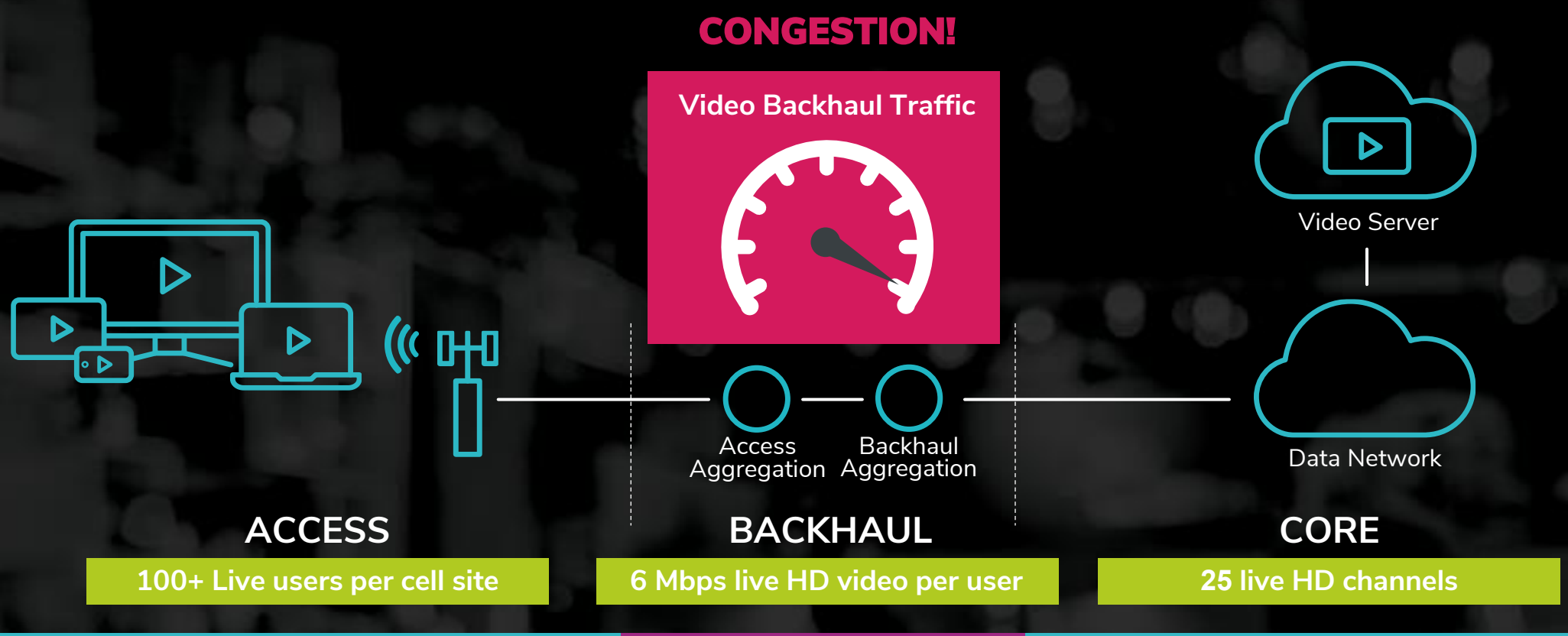
Source: Ericsson, 2020

CAN'T MEET THE VIDEO CHALLENGES



A VIDEO DELIVERY NETWORK EXAMPLE

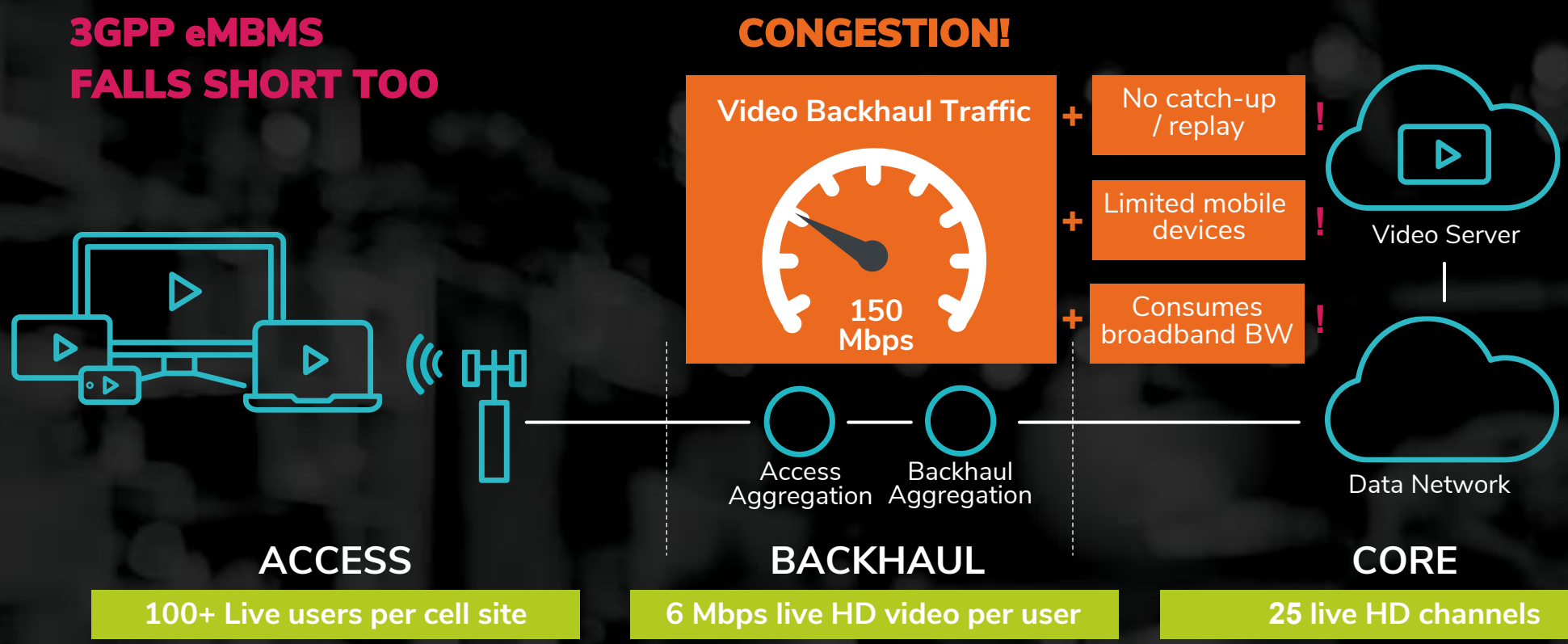
The following example will help us grasp just how video is congesting mobile networks and why mobile networks have little alternative but to throttle down video quality. Before we do, let's glance at a typical backhaul network architecture. The backhaul network is built in a tree architecture, with access aggregation points which typically aggregate about 4 end cell sites on average, and backhauled aggregation sites, which typically aggregate 2-3 such access aggregation points in average, making about 10 end cell sites. Let's imagine we're an MNO wishing to offer a bundle of video content, including 25 live HD channels. Each of these HD channels would require 6 Mbps bandwidth in order to deliver HD content to end user devices. In addition, let's assume that about 100 user devices in each cell site will consume this video service simultaneously, watching one of these channels. ESPN, let's say. Or maybe, HBO.



THE VIDEO DELIVERY CHALLENGE (Warning: Big numbers inside)

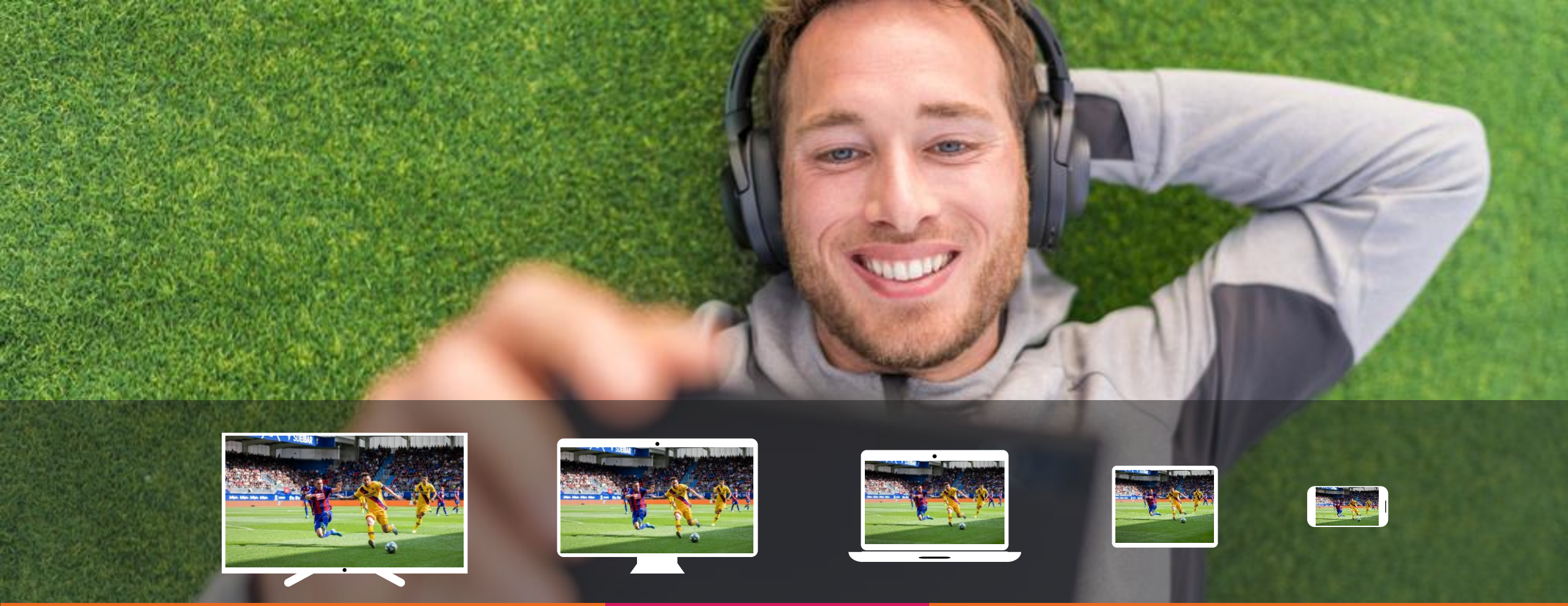
Before long we see the backhaul network is getting congested. On the last backhaul link, from the access aggregation to the cell site, the need grows to 600 Mbps (6 Mbps x 100 user devices), as these streams are being delivered as unicast video streams. It's already apparent this 600 Mbps requirement far exceeds most backhaul links. But we're not done yet. The challenge intensifies as we go to the link between the access aggregation and backhaul aggregation. Here we'll need 4 times that capacity, which is 2.4 Gbps for the backhaul link. (Scarcely any backhaul links exist with these kinds of capacities).
On the backhaul aggregation to the core network, we will need 6 Gbps. When we look at the evidence, it's easy to see that in today's backhaul reality, mobile networks have little choice but to throttle down the video quality and resolution if they are to stand any chance of mitigating congestion and allowing video delivery on current mobile networks.

3GPP eMBMS FALLS SHORT TOO



3GPP EMBMS ARE CLOSE BUT WIN NO CIGAR

The 3GPP has woken up to the fact that unicast is causing severe mobile network congestion and is working to develop standards and formats to enable broadcast over mobile networks. These solutions, known as eMBMS (Evolved Multimedia Broadcast Multicast Service), offer some congestion relief, but fall short in meeting users' expectations from media experiences. eMBMS solutions only allow live broadcast over the mobile network, but no pausing, catch-up or replay. Another drawback is that eMBMS requires unique technology to be fitted into mobile devices which most devices do not currently support. Furthermore, as is the case in unicast, the bandwidth allocated for broadcast delivery comes at the expense of the bandwidth of broadband connectivity, thus degrading broadband services too. The final nail in the coffin is that bandwidth allocated for broadcast delivery needs to be assigned permanently, regardless of the usage variations.

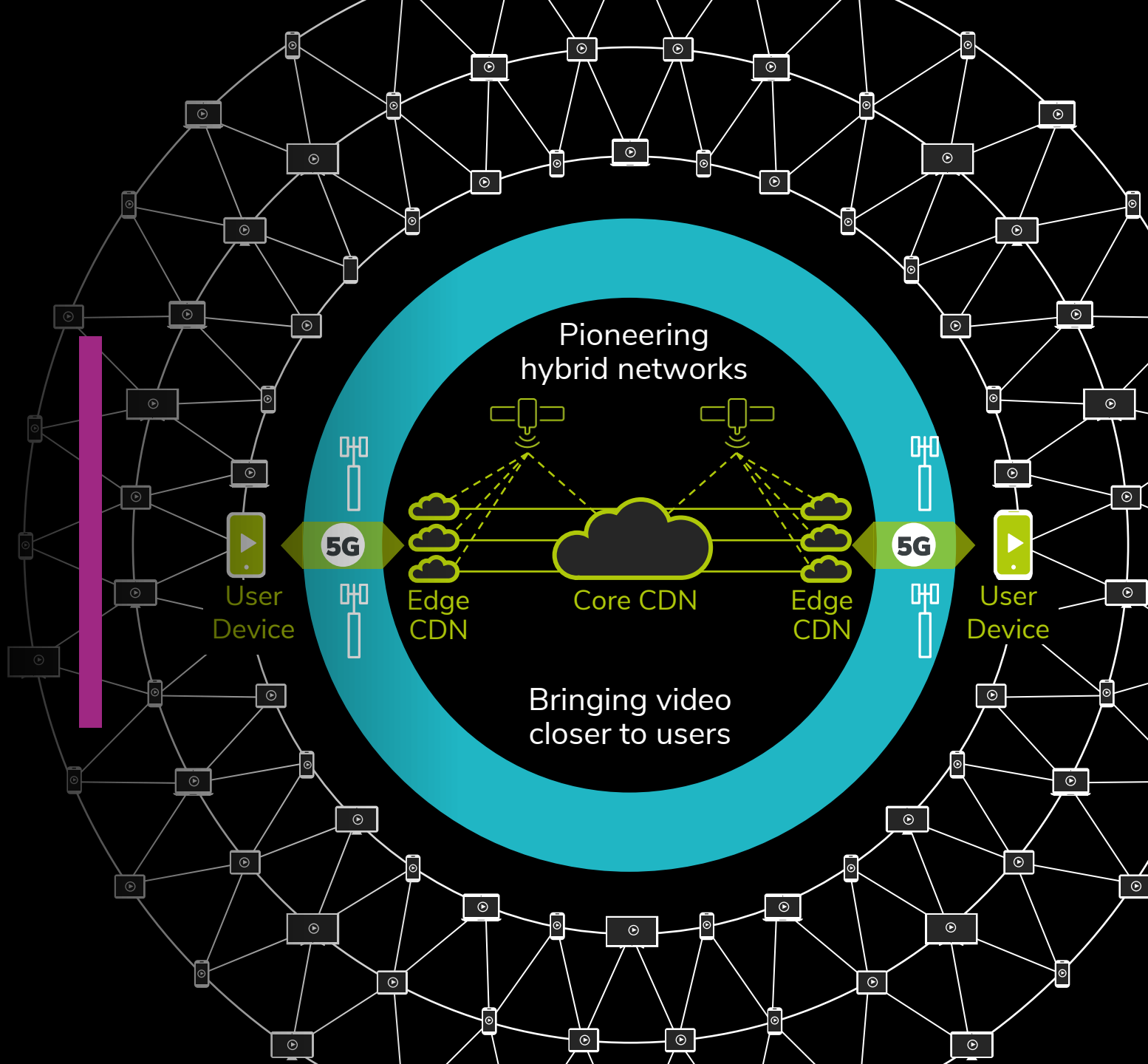


DELIVERING ON THE 5G VISION - A SOLUTION THAT WORKS

NOVELSAT's innovative new approach is a game-changer. By enabling mobile and media companies to actually deliver next-generation high-quality video content everywhere on any user device, it represents the key to unlock the full commercial and user experience potential of 5G.

NOVELSAT TAKES CDN TO THE EDGE

NOVELSAT is unlocking the true potential of mobile networks by leveraging Multi-access Edge Computing (MEC) architecture and taking the Content Delivery Network (CDN) to the edge. As pioneers of hybrid networks, NOVELSAT offers highly efficient video overlay from the core CDN to the edge, bringing 5G video experiences closer than ever to users. NOVELSAT is great when deployed over terrestrial networks, and awesome when deployed with satellite and utilizing satellite broadcasts to deliver video content to the edge.



TERRESTRIAL BACKHAUL BYPASS

Offloading video traffic

MULTI-CHANNEL TRANSCODING

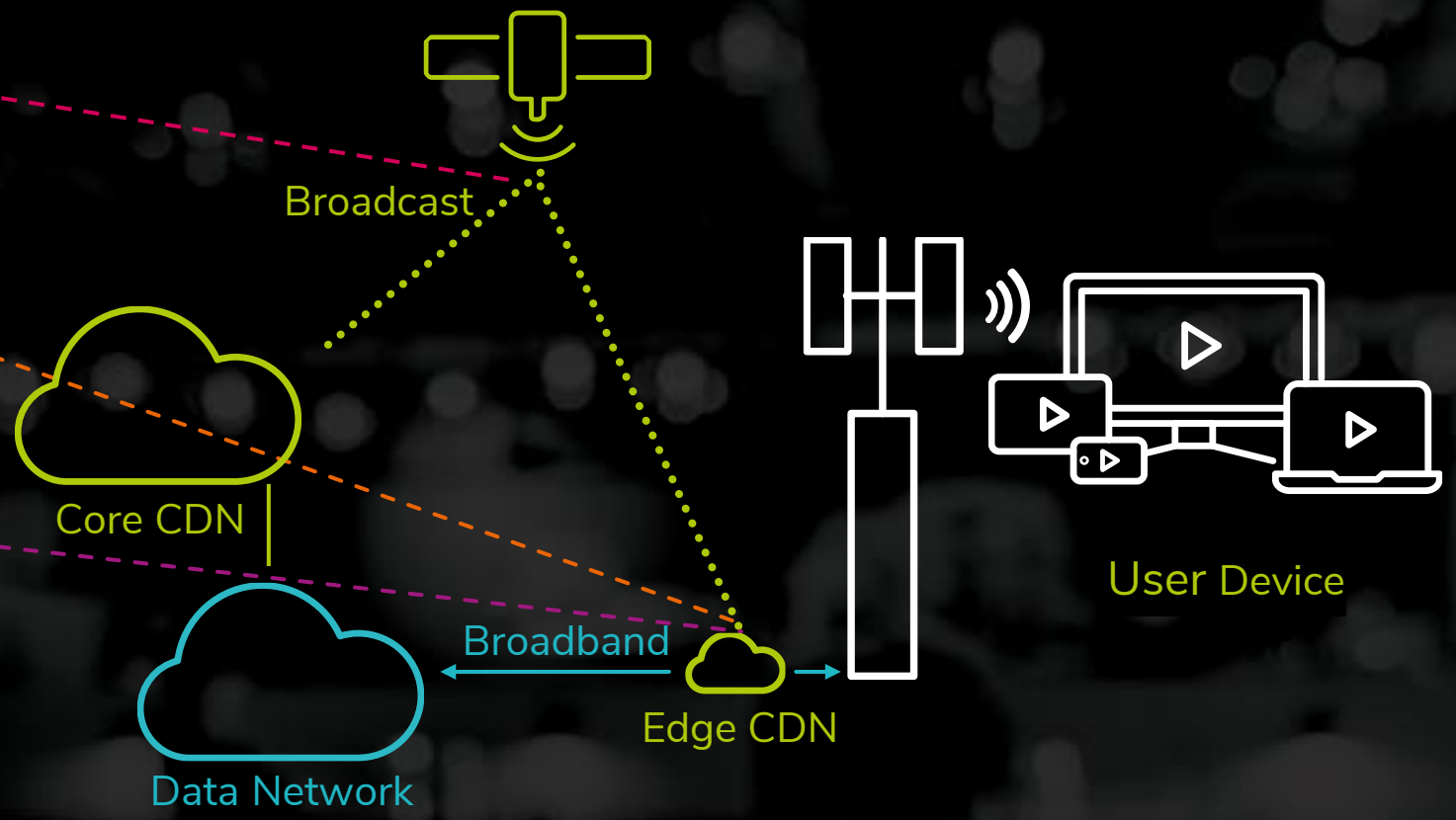
Outstanding bandwidth efficiency

EDGE VIDEO DELIVERY

Highest QoE to any device

CONTENT PROTECTION

Leading end-to-end security (DRM)



PIONEERING END-TO-END 5G VIDEO NETWORKS

When it comes to enabling end-to-end 5G video networks, NOVELSAT is way out in front, with the innovative technology list includes the following. **Multichannel transcoding** for outstanding bandwidth efficiency coupled with single profile delivery of the highest quality that eliminates the need for multiple profile delivery. **Edge video delivery nodes** capable of delivering the highest quality video experience to any device. **Content Protection technology** for securing distribution rights of content providers. It is noteworthy that we can do all of this **over either terrestrial or satellite** connections (whereby the broadcast capabilities of satellites are leveraged to offload video traffic from the broadband network).

REVOLUTIONIZING VIDEO CONTENT CONNECTIVITY FOR THE 5G ERA

NOVELSAT is reinventing video content connectivity for the 5G era via two main components: NOVELSAT Video Core Cloud and NOVELSAT Video Edge Gateway.

NOVELSAT Video Core Cloud is responsible for content acquisition from multiple sources in multiple formats, performing multi-channel transcoding to HEVC and satellite modulation, and transmitting a single high-quality profile of each video channel.

NOVELSAT Video Edge Gateway performs content processing and delivery, demodulating the satellite transmission, executing decoding and transcoding, generating multiple video profiles, performing multi-profile packaging and delivering live video streams to any user device at network edge over the wireless network. In addition, local caching can be introduced here to store high demand video content as well as live content for a given period of time, enabling pause/catch-up/replay capabilities as well as VOD services.

NOVELSAT VIDEO CORE CLOUD

Content acquisition - multiple sources, multiple formats

Multi-channel transcoding to HEVC

Satellite modulation to NOVELSAT NS4™

Transmitting a single high-quality profile of each video channel

NOVELSAT VIDEO EDGE GATEWAY

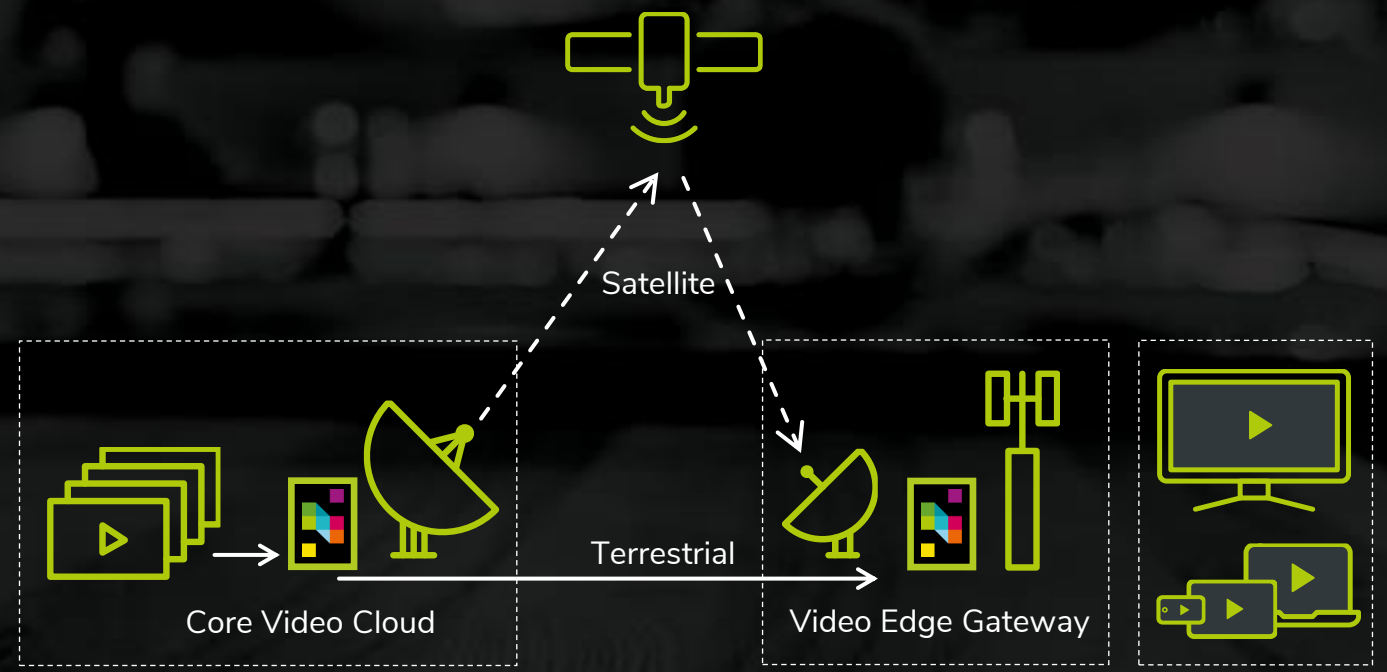
Content processing and delivery

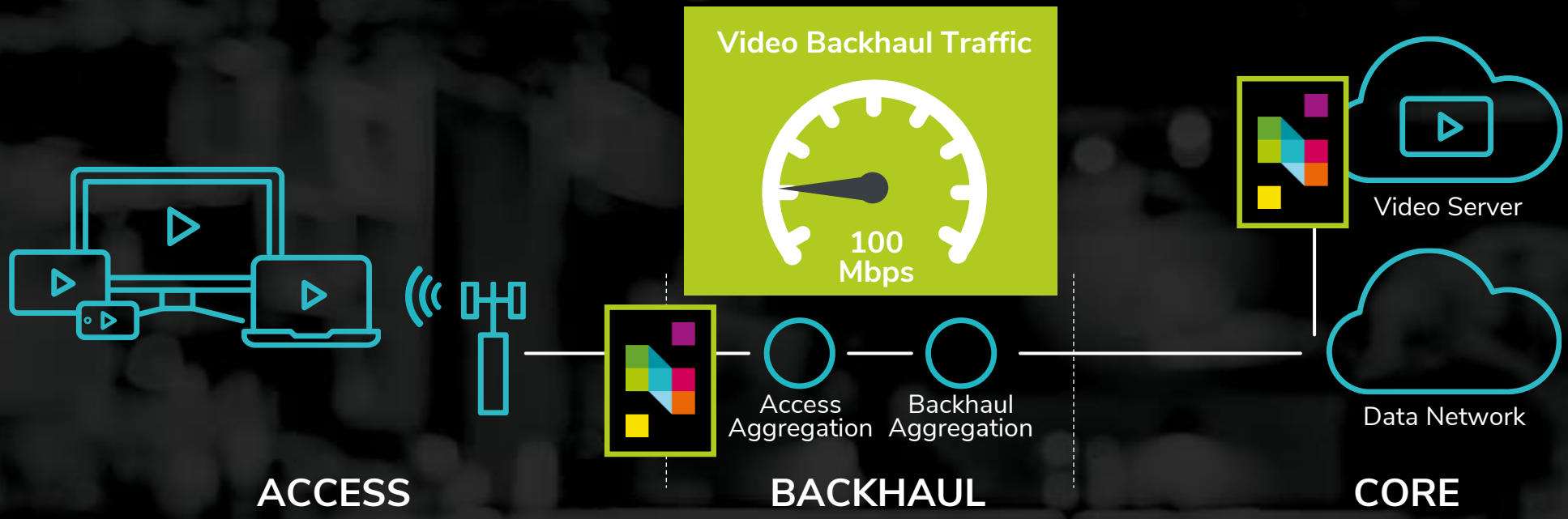
Satellite demodulation

Video decoding and transcoding

Multiple video profile generation and packaging

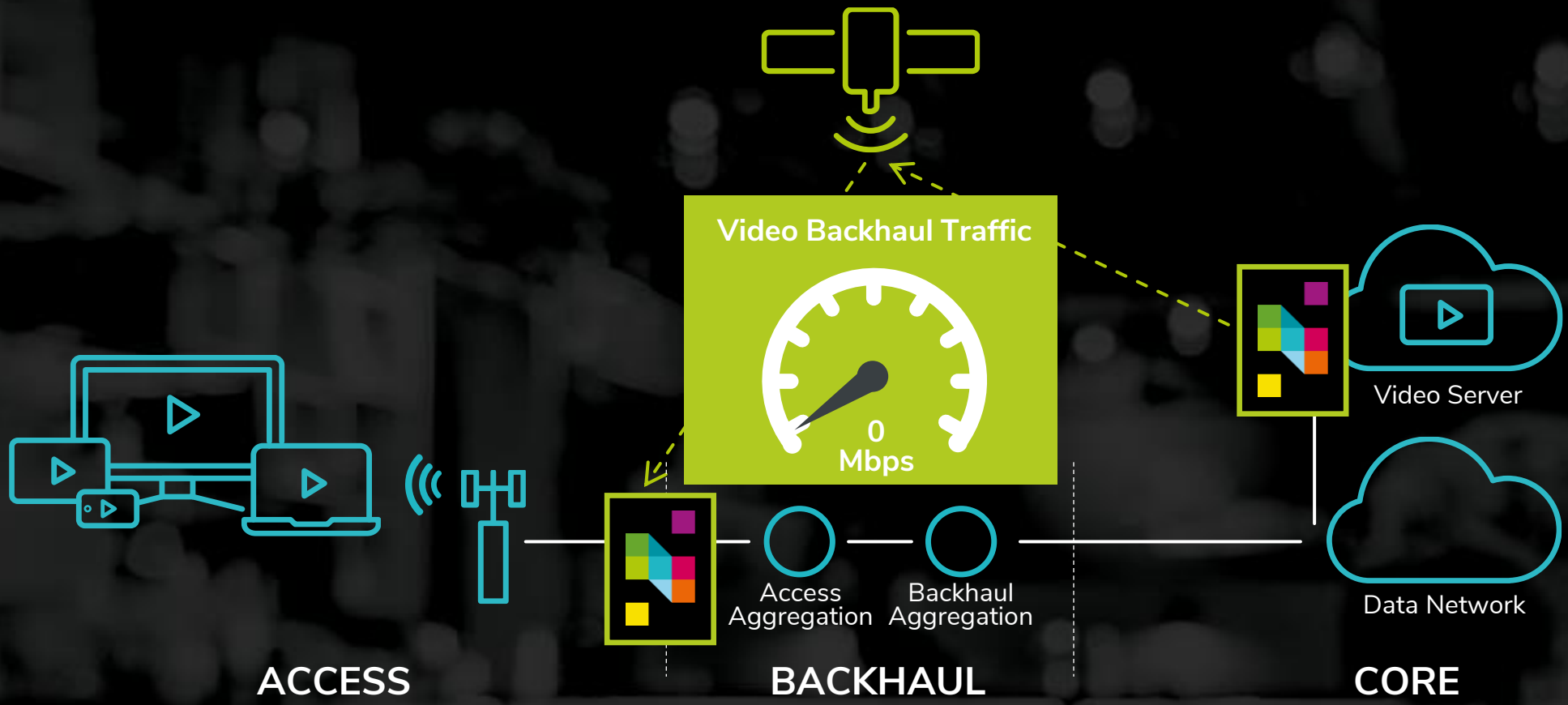
Live video delivery to user devices





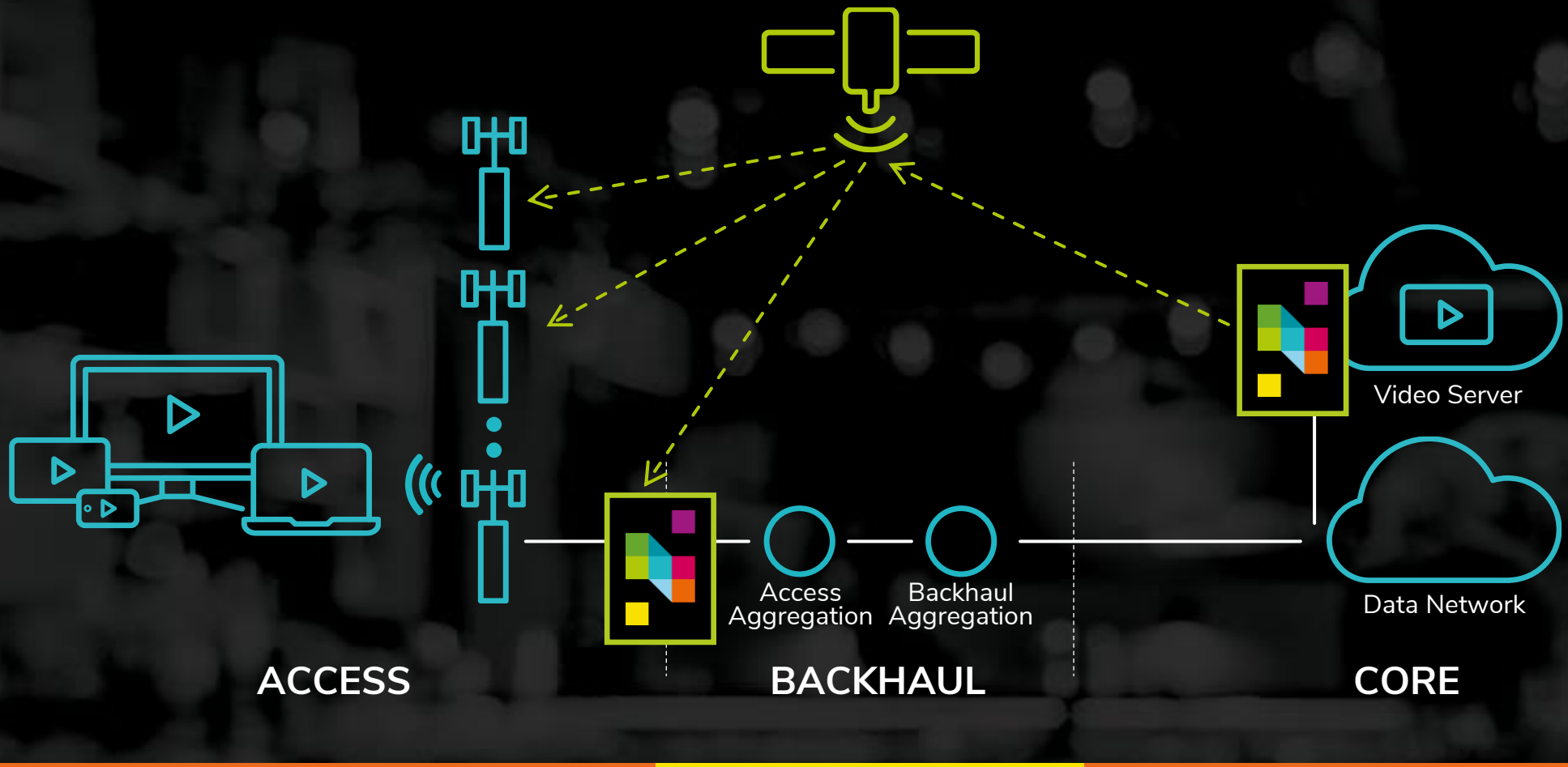
MITIGATING BROADBAND CONGESTION WITH NOVELSAT

Bandwidth congestion is a major experience killer for mobile subscribers watching video on their mobile devices as mobile networks throttle down video quality to free up bandwidth. By implementing NOVELSAT's solution over their terrestrial backhaul connections, mobile service providers can mitigate a significant portion of the congestion. Delivery of the video bundle with NOVELSAT will now consume only 100Mbps across all backhaul links. Significantly lower that the 600/2,4000/6,000 Mbps in unicast delivery.



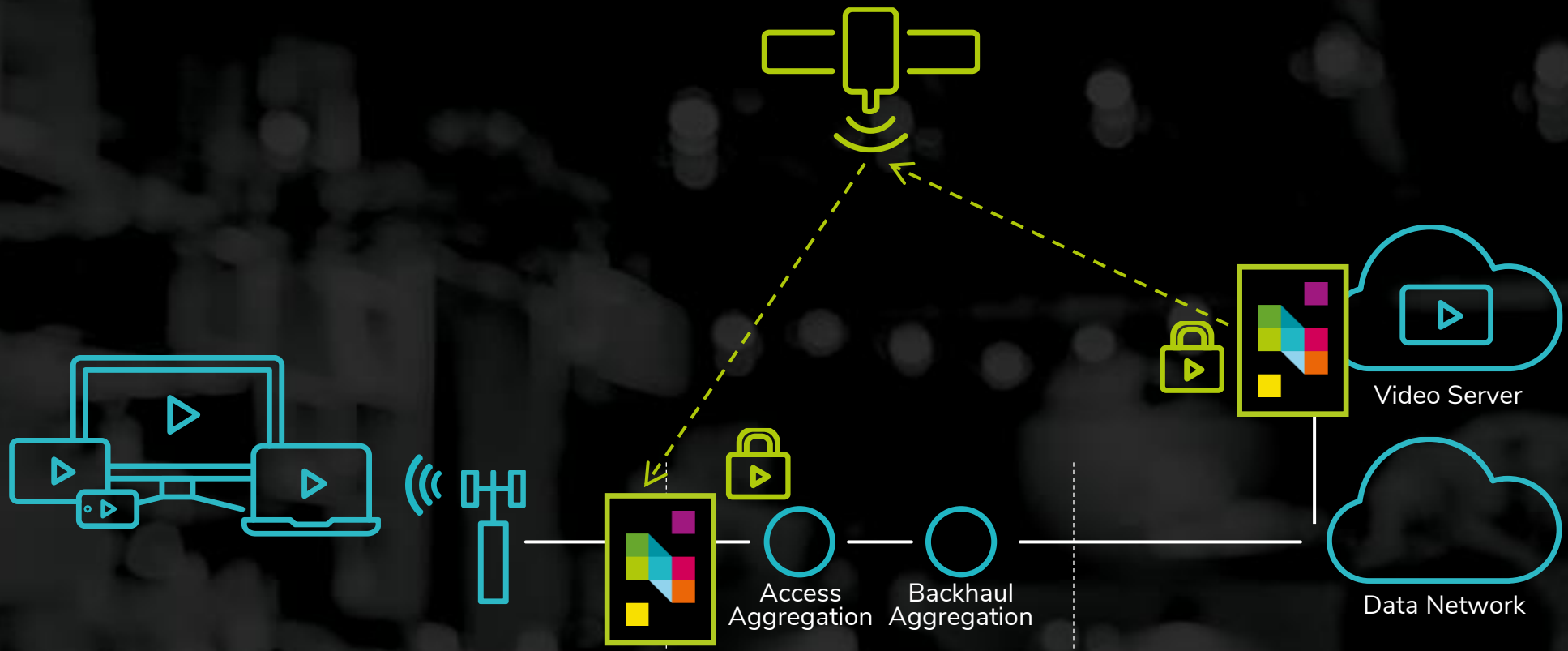
MITIGATING BROADBAND CONGESTION USING SATELLITE BYPASS

What's more, mobile providers can benefit from even greater efficiencies when NOVELSAT's solution is implemented over satellite. This is done by using the satellite to bypass the terrestrial backhaul connections, delivering the video content directly to the edge locations, offloading that video services from the terrestrial network.



ELEVATING BROADCAST EFFICIENCIES

By utilizing satellite for video content delivery, NOVELSAT is able to deliver additional efficiencies to mobile service providers. Leveraging satellite's inherent broadcast capability allows us to use a single bandwidth to broadcast video content to hundreds and thousands of cell site locations - reducing bandwidth congestion and opening the way for massive live-streaming and video experiences.



SECURING CONTENT RIGHTS, INCREASING PEACE OF MIND

For content providers, protecting content rights is fundamental to their business model. NOVELSAT's extensive security algorithms and mechanisms ensure highly secured media delivery. Implementing multi-layer content protection, together with a highly flexible entitlement management system and an automatic and dynamic key generation with over-the-air distribution, we are able to provide customers with a new level of content protection.

REDEFINING MOBILE VIDEO EXPERIENCES

5G is going to transform the way we watch and experience video. Whether this is a sports fan live-streaming a soccer match while being able to watch real-time replays of the action, or as a TV aficionado enjoying their favorite on-demand TV show in top quality on the beach. NOVELSAT enables mobile and media companies to distribute a very high volume of live or on-demand video content, at the highest quality and with the lowest latency, to maximize user experience.

LIVE AND ON-DEMAND

HIGH VOLUME

HIGHEST QoE

UNLOCKING TRUE 5G PERFORMANCE

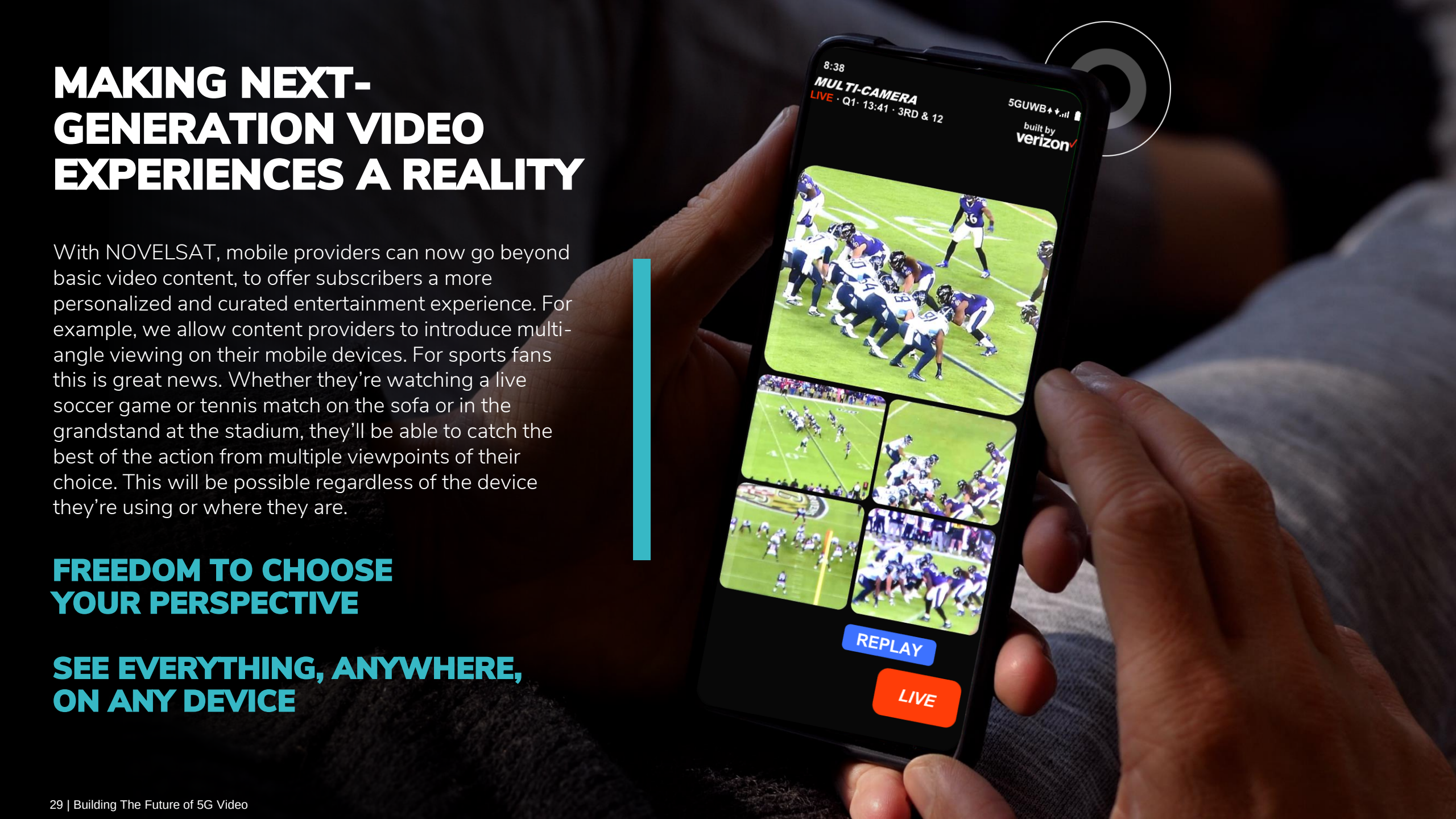
With 5G radio access network (RAN) enabling higher capacities and speeds than ever before, NOVELSAT makes it possible for content providers to take full advantage of 5G capabilities, delivering high volumes of video content from the core, and opening the door for new business models and monetization opportunities.

MAKING NEXT-GENERATION VIDEO EXPERIENCES A REALITY

With NOVELSAT, mobile providers can now go beyond basic video content, to offer subscribers a more personalized and curated entertainment experience. For example, we allow content providers to introduce multi-angle viewing on their mobile devices. For sports fans this is great news. Whether they're watching a live soccer game or tennis match on the sofa or in the grandstand at the stadium, they'll be able to catch the best of the action from multiple viewpoints of their choice. This will be possible regardless of the device they're using or where they are.

FREEDOM TO CHOOSE YOUR PERSPECTIVE

SEE EVERYTHING, ANYWHERE, ON ANY DEVICE



POWERING BOUNDLESS VIDEO EXPERIENCES

NOVELSAT brings the future of immersive entertainment into the here and now. Content providers can offer subscribers a complete world of immersive and interactive experiences - Multiview, 3D, 360, or VR - delivered at source quality, in real-time, anywhere, anytime.

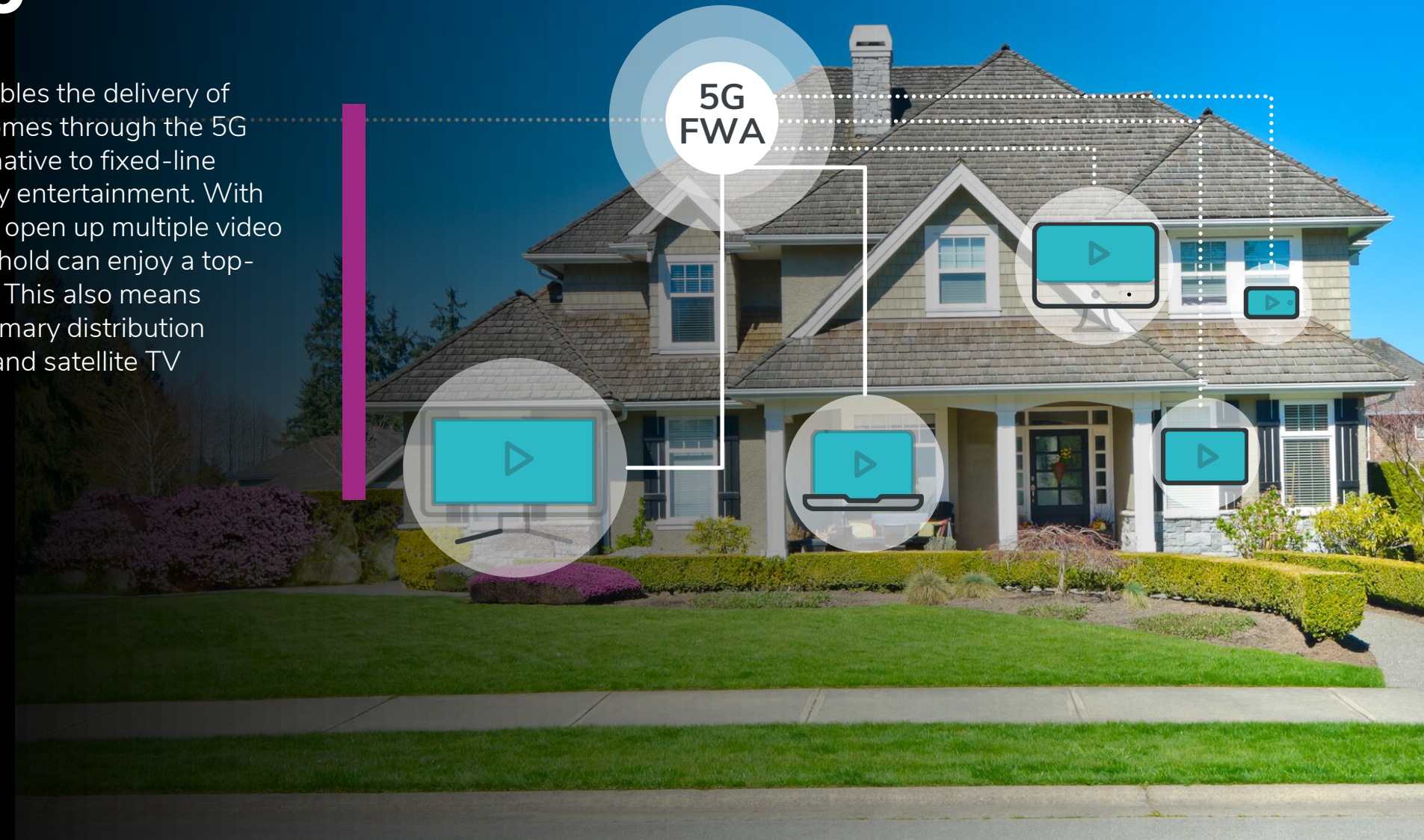
WATCH AT THE BEST VIDEO QUALITY

GET ANY EXPERIENCE, AT ANY BITRATE

VIEW LATENCY FREE

FUELING FIXED WIRELESS BROADBAND WITH 5G VIDEO

Fixed Wireless Access (FWA) enables the delivery of high-bandwidth connectivity to homes through the 5G network, presenting a viable alternative to fixed-line networks. It's great news for family entertainment. With NOVELSAT, FWA technology can open up multiple video streams, so everyone in the household can enjoy a top-quality video from MTV to DogTV. This also means mobile providers can become a primary distribution channel for video, knocking cable and satellite TV services from their thrones.



SCALING 5G VIDEO FOR HIGH DENSITY LOCATIONS

Waiting at the gate for your plane to board is a perfect time to catch up on your favorite TV shows. Which is why locations like airports, train stations, shopping malls, hotels, enterprises, or campuses, where you find high concentrations of people watching video content in parallel, places major congestion challenges on network capabilities. NOVELSAT provides these locations with the ability to enable live and on-demand content, at high quality, without overloading the network.

AIRPORTS, TRAIN STATIONS

SHOPPING MALLS, HOTELS

ENTERPRISES, CAMPUSES

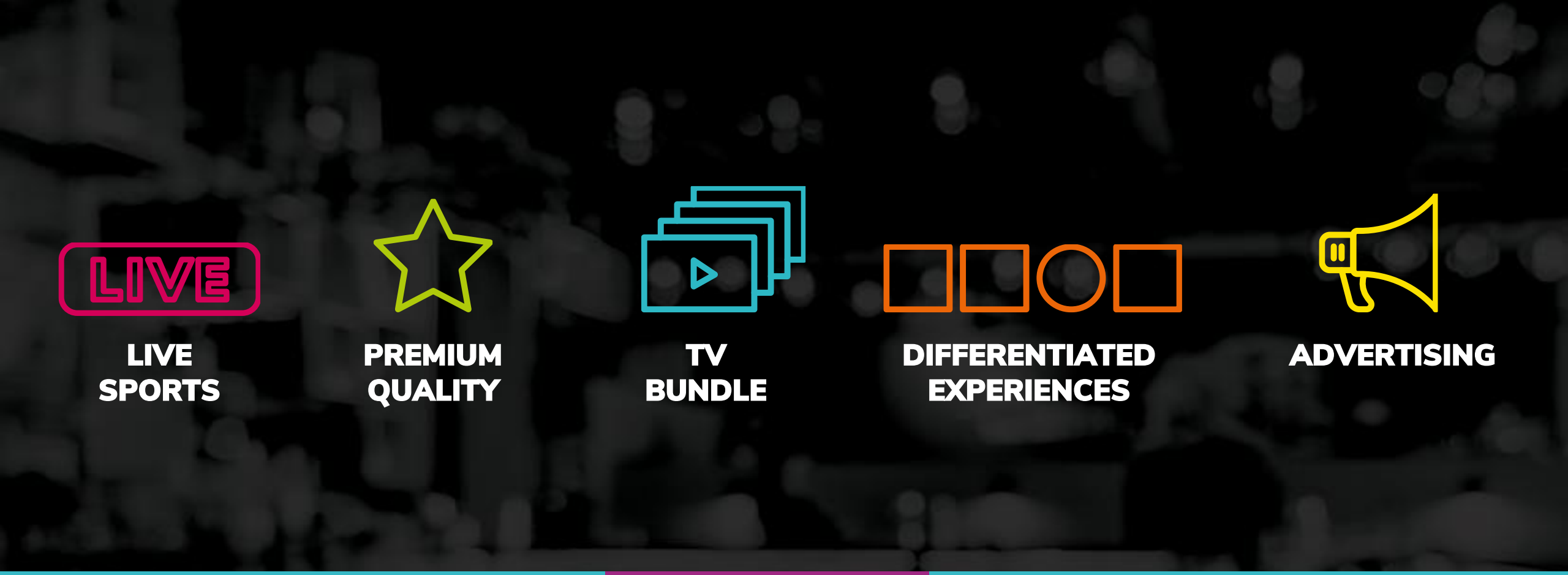
DELIVERING 5G PASSENGER EXPERIENCE

Once you're settled in your seat on the plane (or train or cruise ship), your appetite for watching live games or on-demand TV show on your mobile device grows. As terrestrial connections are not available, passengers must rely on limited satellite connectivity. The experience for travellers can be expensive and patchy due to narrow bandwidth and slow download speeds. NOVELSAT transforms the travel entertainment experience by bringing passengers 5G video experiences and enabling high volumes of video content without compromising an iota of content quality. Bon voyage!

AIRPLANES

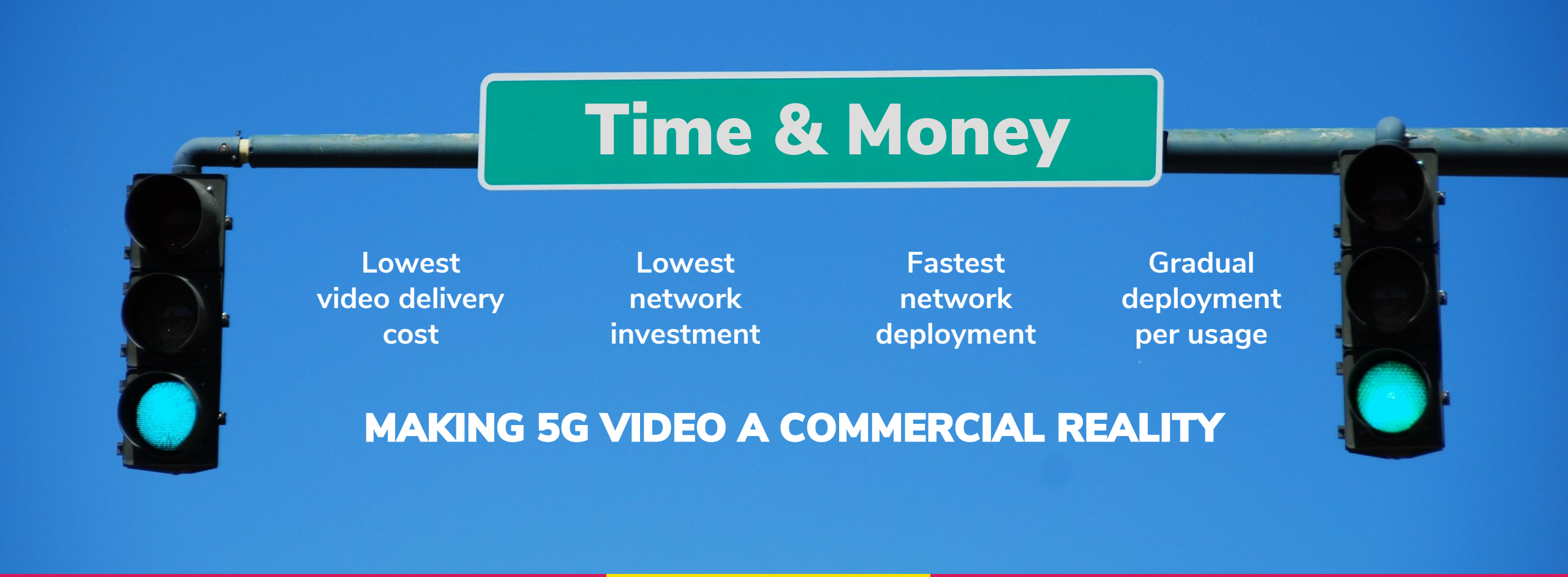
CRUISE SHIPS

TRAINS



NEW VIDEO SERVICES, NEW REVENUE STREAMS

Gone are the days of mobile service providers being commoditized data pipes providers! NOVELSAT's 5G video solution opens the door wide to new business models that will drive up ARPU by enabling MSPs to offer a host of new video services. Among these, high-quality live sports content, premium quality connectivity at cost, and multi-channel TV bundles (turning up the heat on a traditional broadcasters). NOVELSAT gives service providers a pathway to create nexgen video experiences like Multiview, 360 or VR - setting them apart from legacy broadcast services. As video is the dominant vehicle for advertising, the dollars are sure to start flowing also from lucrative ad deals.



REVAMPING VIDEO DELIVERY ECONOMICS

New business opportunities are just part of the story. NOVELSAT's 5G video solution offers a compelling story both in terms of network investment and deployment time. NOVELSAT promises to deliver market-leading video delivery economics: the lowest video delivery costs as well as the lowest network investment. Beyond this, NOVELSAT offers a versatile approach to deployment - rapid full-scale rollout or staged model - aggregation sites to end sites, per usage and take rate of the video services by end users. Without compelling performance and smart economics, 5G video is a nice dream. With NOVELSAT it becomes a commercial reality.

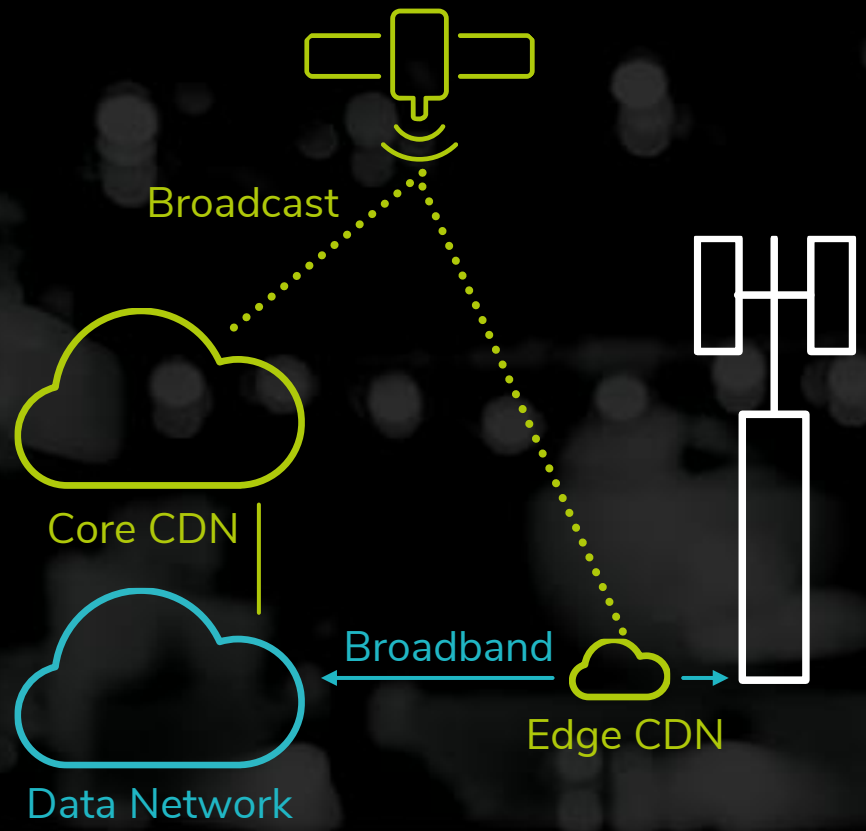
EXECUTING A PHASED APPROACH FOR 5G VIDEO ROLLOUT

Why run when you can walk? So thinks NOVELSAT. When launching new 5G-enabled video services, NOVELSAT enables a phased roll-out approach, which makes sound economic sense. Service providers can dip their toe in the water with the core CDN and deploy the edge CDN only at the aggregation sites, bringing the content to these sites via satellite and utilizing existing terrestrial connection to end cell sites. As take rates grows and video service usage increases, deployment of edge CDN can be expanded to end sites, bringing video content to all cell sites and mitigating or bypassing all terrestrial backhaul connections. Service provider can then also beef up the video offering by expanding the core CDN and the edge CDN to carry and store more content.

23 HD CHANNELS
2 UHD CHANNELS

2,000
CELL SITES

5 YEARS
PROJECT DURATION



1,000 SUBS/CELL
5% VIDEO PENETRATION
➔ 50 VIDEO SUBS
1 HD STREAM PER SUB

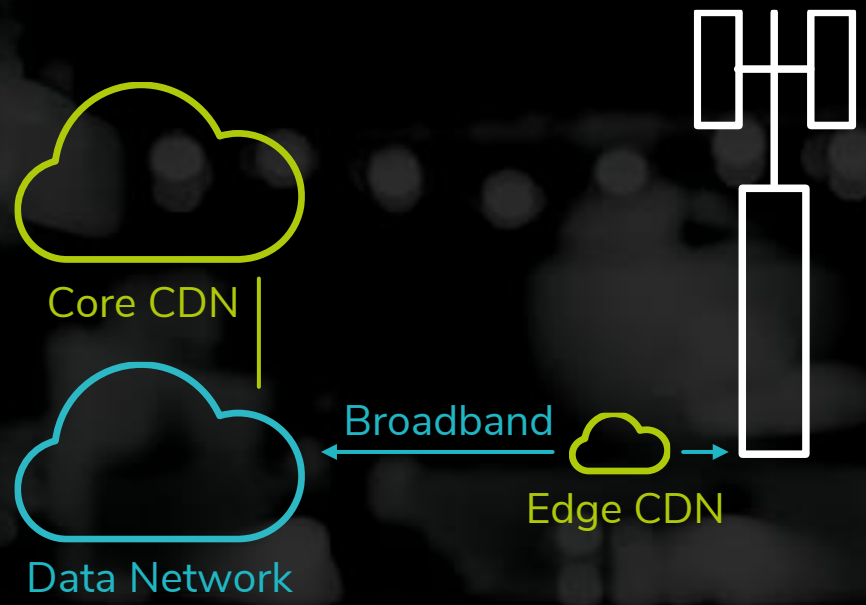
25 FWA/CELL
25% VIDEO PENETRATION
➔ 7 FWA VIDEO SUBS
3 HD STREAM PER SUB
1 UHD STREAM PER SUB

ESTABLISHING A COMPELLING BUSINESS CASE

To better understand the business case and how it stacks up against alternatives, let's consider the following use case example. A service provider is looking to offer a service of 25 TV/video channels - 23 HD and two 4K UHD. The mobile network includes 2,000 cell sites, each serving 1,000 mobile users and 25 FWA-connected homes. Let's assume the following. A project and service duration of 5 years. A take rate of 5% of mobile users and 25% of FWA-connected homes, translated into 50 mobile users and 7 homes per cell site. And a video service requirement of one HD video stream per mobile user and 4 video streams - 3 HD and one 4K UHD - per home.

Leased fiber backhaul cost **$7,400 /site /annum**

Microwave backhaul cost **$3,060 /site /annum**



Leased fiber backhaul with Edge CDN cost **$2,004 /site /annum**

Microwave backhaul with Edge CDN cost **$2,180 /site /annum**

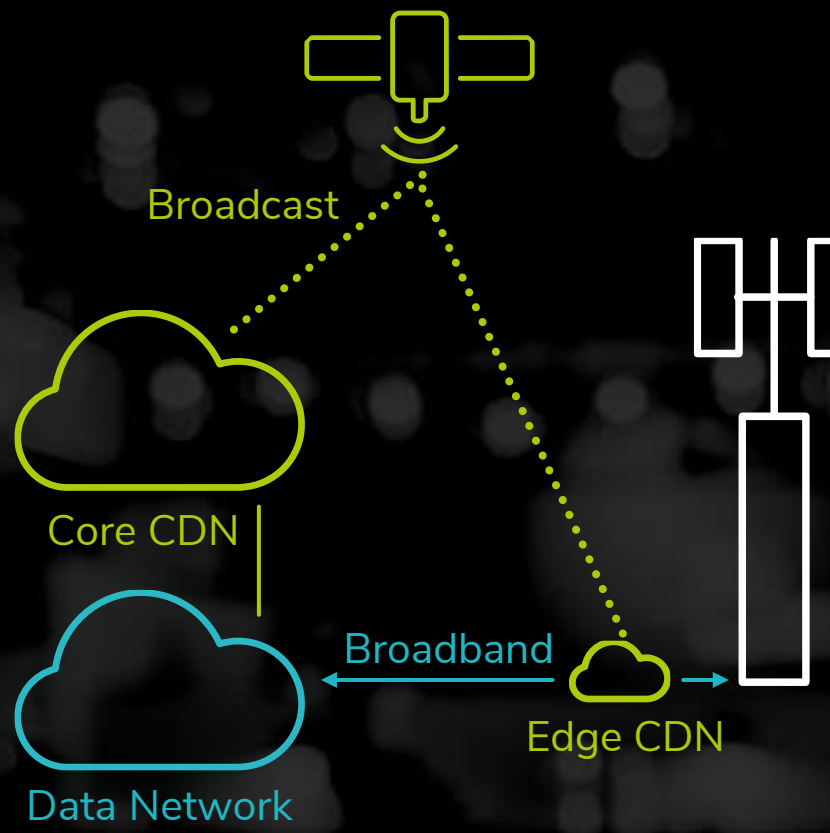
THE ECONOMIC CASE FOR NOVELSAT EDGE CDN CONTINUES...

In this terrestrial-only network, NOVELSAT solutions are deployed over the terrestrial distribution network- leased fiber and microwave-based. Now let's look at the costs of upgrading the terrestrial backhaul network to carry the requested video traffic (at the quantity and quality defined above). We see that implementing NOVELSAT's edge CDN solution translates into major cost savings for both types of terrestrial backhaul networks. For a network based on leased fiber backhaul connections, the cost is reduced more than 300% - from $7,400 to ~$2,000 per site per annum. For a network based on microwave backhaul connections the cost is reduced from $3,060 per site per annum (waiving costs of shifting to fiber where microwave upgrade isn't feasible/economical), to $2,180 per site per annum.

Leased fiber backhaul cost **$7,400 /site /annum**

Microwave backhaul cost **$3,060 /site /annum**

Satellite (without edge transcoding) cost **$3,040 /site /annum**



Satellite (with edge transcoding) cost **$1,683 /site /annum**

SATELLITE + EDGE CDN IS BY FAR THE MOST COST-EFFICIENT SOLUTION FOR MOBILE VIDEO DELIVERY

HERE COMES THE PUNCHLINE...

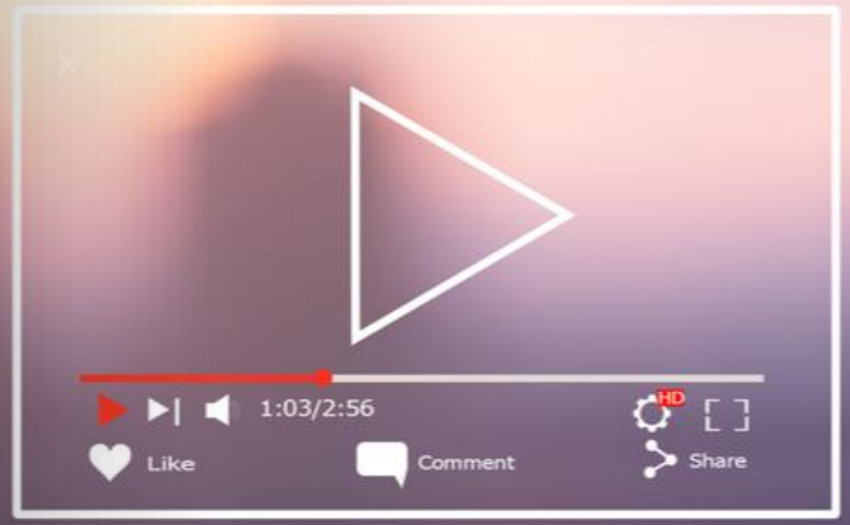
And there's more. Implementing NOVELSAT's edge CDN solution with satellite video distribution yields even greater savings - bringing down the required investment to only ~$1,700 per site per annum. The bottom line is: taking CDN to the edge together with satellite video distribution is by far the most efficient and economical solution for delivering next generation 5G-enabled video services.

IN SUMMARY

The promise of 5G is immense. It has the potential to transform the future of how we consume entertainment in a way few can conceive. By becoming the content-of-the-future distribution network, it has the potential to disrupt the hegemony of TV broadcasters, and install mobile service providers as the new royalty. Not just as providers of HD quality video everywhere, but as the curators of a new genre of immersive video experiences. The market potential is in the hundreds of billions. But there's a catch: the limits of today's mobile networks to handle the tsunami of video content. Only a new high-performance and highly efficient solution that can boost network capabilities for video delivery can save the day and unlock the commercial opportunities. At NOVELSAT, we're ready. Are you?

ABOUT NOVELSAT

NOVELSAT is a leading provider of next-generation content connectivity solutions. Powered by innovative technologies, our broadcast and broadband solutions are transforming networks' capabilities to expand growth potential and to drive new experiences on any device, anytime, anywhere. Our high-performance products for satellite and terrestrial content connectivity include integrated video solutions and highly efficient broadband connectivity solutions, as well as best-in-industry content security solutions. Transforming delivery of data and video with new levels of performance, efficiency, agility, and security, NOVELSAT empowers mission-critical and demanding applications for the mobile, media, entertainment, government, and mobility markets.



NOVELSAT

THANK YOU FOR READING.

Want to learn more? Let’s talk.
info@novelsat.com