



DECARBONIZING VIDEO PRODUCTION

Removing CO₂e emissions from TV and video at source



Foreword: Let's keep sports and live events sustainable

During the Rio 2016 Olympic cycle, I competed in sailing events all over the world, and saw beaches, marinas and harbours littered with plastic. That experience ignited a passion in me for looking after the ocean and the planet as a whole.

It also made me take a look at how my own activities impact the environment. Sports and live events are hugely life enhancing and generate economic benefits – but that can come at a cost, from the waste generated by spectators to the carbon emissions from event and TV production.

It's the responsibility of everyone involved, including athletes, organizers and broadcasters, to do whatever they can to reduce these impacts and ensure that people can enjoy live sports in a more sustainable way.

As both an International Olympic Committee (IOC) Sustainability Ambassador, and the global spokesperson for Sustainability for SailGP, I work to raise awareness of these issues, and influence people to change behavior.

Hannah Mills OBE

Olympic Gold Medallist,
Women's 470 Sailing Rio 2016 and Tokyo 2020

I'm also excited by the potential of new clean technologies that can help reduce waste and emissions at source – before they become a problem.

Producing and editing video using cloud native technology is one example of this. By doing more remotely, it reduces the need for travel and outside broadcasts, and therefore the carbon footprint of sports and other live events. I'm happy to see in this white paper that more broadcasters and content producers are moving in this direction and that the benefits are becoming clearer to see.

As we move towards a net zero world, adopting green technologies like Blackbird, will become ever more important in achieving our climate goals.



Lights, camera – action on climate

In late 2021, as the world’s leaders came together for the COP26 climate change conference, a group of 12 leading broadcasters were also gathering in Glasgow – with a mission of their own.

They were there to sign the Climate Content Pledge – promising to use their channels to reach wider audiences with content that educates about the climate crisis.

While this won’t reduce emissions directly, it’s a sign that the TV and video industry is waking up to the need for action on climate change. There’s a growing recognition of the industry’s own climate impact, which was highlighted by a recent study on the impact of streaming by the UK’s Carbon Trust.

It showed that each hour of video streaming releases 55 grams of CO₂e¹. That might seem small, but the demand for video content and the number of people who stream it, is growing exponentially.

The top 10 shows streamed on a popular platform accounted for 6 billion hours of streaming in just their first two weeks after release² – using the Carbon Trust’s calculation, that’s 300,000 tonnes of CO₂e.

So how do we square the circle between the world’s insatiable demand for video and sustainability? In this white paper we look at the innovative technologies that are revolutionizing the way video is produced, from cloud native video editing to streaming and graphics. These pioneering cloud native technologies offer the potential to dramatically reduce carbon impact at source because they are engineered sustainably from the outset.

We will demonstrate that using a cloud native video editing solution can save up to 91% carbon emissions compared to a traditional workflow whilst also enabling further efficiencies in operations costs, speed and flexibility.

Leading broadcasters will also reflect on the importance of integrating cloud native technology to achieve greener workflows.



Written in conjunction with Green Element, environmental management consultancy.

1. <https://www.carbontrust.com/resources/carbon-impact-of-video-streaming>

2. Streaming’s dirty secret; how viewing Netflix top 1- creates vast quantity of CO₂e/TV streaming/The Guardian



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480bn hours

of live streaming
per year³

79,203 km²

of sea ice loss⁴

16 x size

of the Grand Canyon
National Park

Statista estimates that 480 billion hours of video is live streamed globally each year. Based on the Carbon Trust's calculation of emissions from streaming, and research on the impact of emissions on sea ice, this results in an area the size of Scotland or 16 x the Grand Canyon National Park being lost annually.



3. www.statista.com

4. Notz & Stroeve, Science, 354 (2016), pp. 747-750, Observed Arctic sea-ice loss directly follows anthropogenic CO2 emission (1 metric tonne of CO2 melts 3m2 of arctic sea ice.)

The road to net zero – turning pledges into reality

As the real-life impacts of climate change are increasingly felt around the world, from burning forests to melting ice caps, the pressure is mounting to move from words and pledges to real measurable action.

Governments and regulators in many countries are tightening requirements for businesses to report on climate impacts. Many stakeholders and customers are looking for businesses to have clearer commitments to achieve net zero and work towards science-based targets. Increasingly, companies are held responsible not just for their own emissions but for those in their supply chain, known as Scope 3 emissions. (More about this on page 5).

It's clear that the time for talking about climate action is over. It's time to walk the walk.

Reducing the carbon impact from TV and video

So what does all this mean for the TV and video industry? It's clear that demand for video is only going one way – up. If we can't reduce consumption, the only way to decarbonize is to remove emissions at source, by reducing the energy used in streaming and in TV and video production.

The cloud platforms that support streaming, from AWS to Microsoft Azure and Google Cloud, are working hard to reduce emissions – for example by making data centres more efficient and switching to renewable energy. Microsoft has committed to be carbon negative by 2030 – removing more carbon from the atmosphere than it emits.

Broadcasters and content makers are reducing emissions by migrating more of their workflows to cloud based production – a trend that has accelerated during the pandemic as

lockdowns forced more activity online (see page 7).

Advances in cloud native technologies – which don't need the same virtual servers and storage as cloud based solutions – are making further carbon reductions possible, from live video editing to video compression and live graphics. They're designed to work within the cloud, rather than retrofitting to existing systems (see page 9).

Reducing your organisation's carbon footprint

BAFTA's sustainability organisation, albert, offers a calculator tool that can help you map and record your carbon footprint from on premise TV and video production. It can also help you build an action plan to reduce emissions and certify sustainability on completion of the plan. Certification agencies can also help you to identify goals and record your achievements – including Certified B and the Carbon Trust.

45%

reduction in emissions needed from 2010 levels to limit rises in global temperatures to 1.5°C by 2030.⁵

5. SDG Indicators (un.org)

Navigating net zero

Net zero is the balance between the amount of greenhouse gas produced and the amount removed from the atmosphere. Organizations reach net zero when the amount they add is not more than the amount they take away.

Carbon neutrality is balancing greenhouse gas (GHG) emissions by 'offsetting' – or removing from the atmosphere – an equivalent amount of carbon to the amount you produce. This can be achieved by buying carbon credits – permission to emit GHGs in exchange for offsetting those emissions – or by supporting a certified initiative in areas such as renewable-energy, forestry or conservation.

Science based targets are greenhouse gas reduction targets that are verified to be in line with keeping global temperature rises below 1.5°C, providing a clear pathway for achieving net zero.

Scope 1,2 and 3 emissions are how releases are categorized by the global greenhouse gas protocol (GHG). Scope 1 emissions are from your in-house operations; scope 2 are from the energy and utilities you buy in; and scope 3 refers to the carbon that your suppliers and partners emit while working on your behalf.

Major corporations set climate pledges

More organizations are committing to decarbonize – adding to the pressure for technology solutions to go further and deliver more carbon savings.

Cloud providers

- Microsoft has committed to be carbon negative by 2030 through a mix of emission reduction, green energy, and carbon capture technologies.⁶
- Google aims to be carbon-free by 2030, using 100% renewable energy for all its activities.⁷
- AWS, as part of Amazon, is committed to achieve net zero emissions by 2040.⁸

Broadcasters

- Netflix is aiming to achieve net zero in its production activity by the end of 2022 through a mix of emissions reduction and carbon offsetting.⁹
- Discovery has committed to achieve net zero for scope 1 & 2 emissions by 2030.¹⁰
- Sky News has pledged to achieve net zero by 2030. It has recently been certified by albert as carbon neutral.¹¹
- The BBC has committed to be net zero by 2030.¹²

6. Microsoft will be carbon negative by 2030 - The Official Microsoft Blog

7. Carbon-Free Energy | Google Sustainability

8. We are all in on The Climate Pledge: net zero carbon by 2040 (aboutamazon.com)

9. About Netflix - Net Zero + Nature: Our Commitment to the Environment

10. Our Planet - Discovery, Inc.

11. Sky pledges to go net zero carbon by 2030 | Business News | Sky News

12. Net Zero by 2030 - Environmental Sustainability (bbc.co.uk)

During 2021, we saw the potential carbon saving remote production can deliver for the industry. BAFTA's sustainability organisation, albert, estimates that emissions per hour of television production dropped more than 50% between 2020 and 2021.



Reducing emissions through remote production

The pandemic lockdowns were difficult for broadcasters and content makers everywhere. But they did have one welcome side-effect. Producers moved more of their workflows to the cloud to avoid shutting down completely – which brought large savings in energy consumption, travel and emissions.

Advances in cloud based technology mean that editing and post-production workflows that were once tied to on premise equipment can now be performed from anywhere via the cloud. This enables video editors and production staff to work from anywhere.

This is a win-win, given the additional financial savings on travel, accommodation and transportation of equipment. A move towards migrating

workflows to the cloud was already underway but was accelerated dramatically during the pandemic as producers saw it was the only way to keep production going.

In a recent survey into Cloud Production Trends by Caretta Research, 90% of video professionals have adopted cloud production and remote editing into their workflows.¹³

During 2021, we saw the potential carbon saving it can deliver for the industry. BAFTA's sustainability organisation, albert, estimates that emissions per hour of television production dropped from 9.2 tonnes of CO₂e to 4.4 tonnes between 2020 and 2021¹⁴ – a reduction of more than 50%.

Some of this reduction resulted from production that was forced to shut down, so it's unlikely that all of the gains will be maintained post-pandemic. However, it is still a huge step towards reducing the industry's overall carbon footprint.

13. Cloud Production Trends Report April 2022, Caretta Research.

14. Albert Annual Report 2020-21 Annual-Review-2020-21_Downloadable-Version.pdf (wearealbert.org)

How does production contribute to CO2e?



Buildings and premises



Transportation



Travel



On-site equipment/trucks



Physical infrastructure



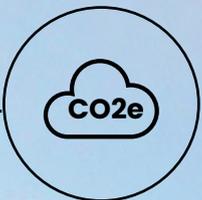
Network infrastructure (servers/storage)



Data centres, virtual servers and processors



Bandwidth requirements



Going cloud native to decarbonize workflows

The shift to cloud based remote production has shown what's possible if there is the motivation to change - but it can't achieve all the carbon reductions that are needed. Greener technologies that enable workflows to be lifted entirely within the cloud are the next step towards decarbonization.

Many traditional cloud based production applications were adapted from existing on premise systems. They solve the problem of having to transport people and equipment on site and having physical servers and infrastructure.

But they still need a lot of virtual infrastructure and storage, which uses a lot of power. They also have to move large highbitrate video files up and down to the cloud and require extra computer equipment and bandwidth to enable each

user to connect to the cloud and publish from it.

The recent research into Cloud Production Trends by Caretta Research showed that despite 90% of editors using cloud production and remote editing within their workflows, 65% still move original high-res media files around the internet which is costly and both time and carbon inefficient¹⁵.

Working seamlessly within the cloud

A wave of greener cloud native technologies can achieve further carbon reductions because they have been engineered specifically for the cloud rather than retro-fitted. They work seamlessly in the cloud rather than connecting to it.

Key to this is compressing the vast amount of data generated by video, so that it can be produced and edited entirely within

the cloud without needing large storage or processing capacity or having to go back to a traditional platform for any part of the process.

Cloud native solutions require less bandwidth so they can run off any web browser, and consume much less power because they don't need the same cloud infrastructure or storage as cloud based solutions - resulting in dramatically more sustainable workflows. Because they're engineered to remove carbon at source, they reduce the need for carbon offsetting and carbon credits.

Importantly, saving on emissions can also save business costs, as cloud native video editing technologies reduce total cost of ownership by 35%.¹⁶

15. Cloud Production Trends Report April 2022, Caretta Research.

16. Total Cost of Ownership Report, to download visit www.blackbird.video/tco

Pioneering sustainable technologies

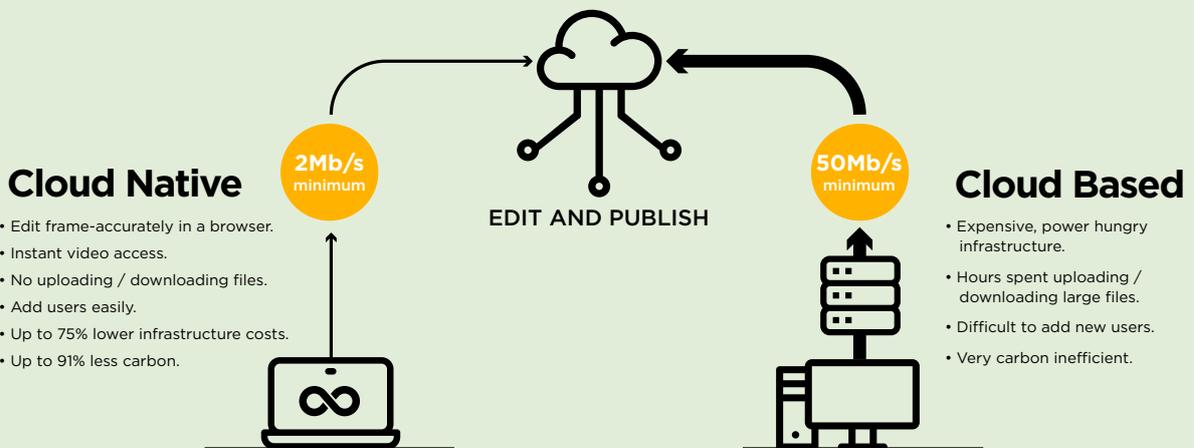
Blackbird is the only cloud native professional video editing platform. It transcodes video from live camera feeds or files into a lightweight proxy version that goes direct to the cloud in real time - hi-res source files never leave the server enabling content to be published back to the viewer in broadcast quality. Blackbird enables frame-accurate video access, editing and distribution, while reducing the need for the heavy virtual infrastructure associated with standard cloud based editing solutions. Vast files can be edited remotely from multiple locations from any ordinary web browser, with no latency or loss of quality - allowing even large-scale live sports events to move to the cloud.



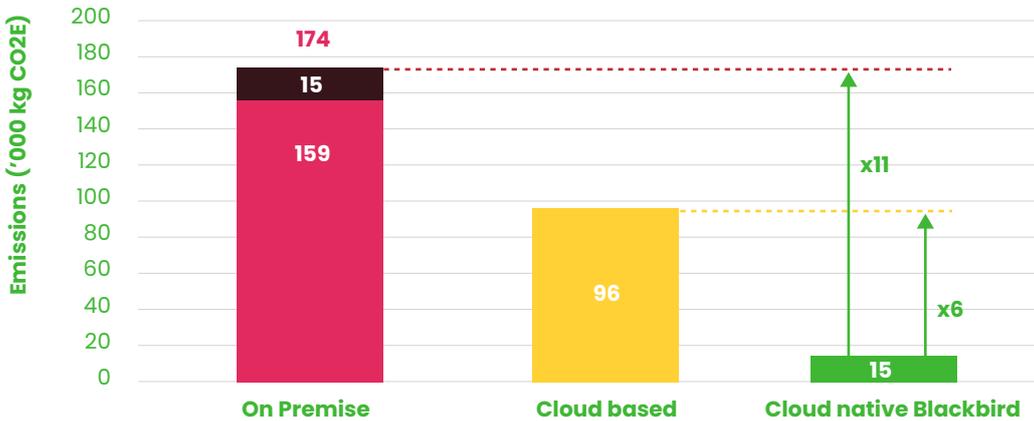
Ateme video compression and streaming/CDN solutions use artificial intelligence to process and deliver vast amounts of video data on any type of network, to any screen. This enables content providers, service providers and streaming platforms to deliver video with the highest quality experience while minimizing bandwidth consumption. Moreover, Ateme's cloud native technology needs less storage, bandwidth and hardware than comparable solutions, offering large savings in energy consumption and emissions.



Singular.Live is a cloud native graphics platform that runs entirely from a web browser. Like Blackbird, it allows operators to work from anywhere and means there is no need for dedicated hardware, saving energy and carbon.



Measuring the carbon impact of video editing of a two week sports event



- 4,000 hours of TV
- 50 editors
- emissions from 2,000km travelled by on premise editors (economy class plane travel) represented by ■

Up to **91% less** CO2e with Blackbird

91%

Emissions saving

35%

lower cost of ownership

To assess carbon emissions from video editing, environmental consultancy Green Element compared the impact of three different model workflows - on premise, cloud based and cloud native. Over a two-week event, the cloud based solution produces six times more carbon than Blackbird. This is because the cloud based solution transmits much more data and needs more hardware over a longer time period, while the power required by Blackbird's low data, low bandwidth solution does not increase significantly.

Blackbird generates up to 91% less CO2e compared to an on premise workflow for a 2 week sports event.

70% less technical infrastructure is required in a live sports event using cloud production workflows, with knock-on savings in CO₂e emissions.

70% reduction in power required for galleries.¹⁷



17. IBC accelerator in media innovation; sustainability in live production, January 24th 2022

Proving the benefits of the cloud for live production

In 2021, sports broadcasters including BBC Sport, BT Sport, Sky Sports and Premier League Productions joined with technology providers, including Blackbird, in a unique project. Their aim was to measure the carbon reducing potential of cloud based production during coverage of a major live event.

The project was organised by the International Broadcasting Convention (IBC) as part of its IBC Accelerator Media Innovation Programme. It measured cloud workflows alongside a traditional outside broadcast (OB) production setup to compare and contrast carbon footprints during a live Premier League game between Liverpool and Newcastle United in December 2021.

All the broadcasters shared their camera feeds, audio, graphics and human resources to avoid duplication and energy requirements in the production chain. The objective was to explore the most sustainable approach possible that can be introduced to a live TV production.

A mix of cloud based and cloud native technologies

The project used a mix of cloud based and cloud native technologies from leading providers including AWS, Blackbird, Hitomi, M2A Media, Microsoft, Singular.Live and Zixi. albert, the Bafta sustainability consortium, produced the carbon calculation.

It showed that 70% less technical infrastructure is required in a live sports

event using cloud production workflows, with knock-on savings in CO2e emissions. It also found that cloud production reduces the need for significant onsite technical facilities because it enables fast distribution of signals to multiple locations.

Findings also confirmed that cloud workflow reduces power requirements in galleries by 70%. Also noted were additional benefits in ease of scalability and adaptability.

The initiative is expected to drive further research on how to reduce carbon, providing industry benchmarks and more measurable insights into live production for the first time.

70%

less technical infrastructure required in a live sports event using cloud production workflows

70%

reduction in power



Leading broadcasters transition to cloud native technology

Leading sports and news broadcasters are making the transition to cloud native technologies as greening workflows and measuring carbon impact becomes a top priority.

Below, Blackbird partners reflect on the results and experiences of moving to cloud native production.



EVS

EVS is globally recognized as a leader in live video technology for broadcast and new media, delivering live sports images, entertainment shows and breaking news to millions of viewers around the world every day.

“Blackbird is helping EVS to expand our live and near-live content management and distribution with cloud native video editing,” says EVS Chief Marketing Officer, Nicolas Bourdon. **“This not only helps us meet the challenging demands of the world’s most prestigious sporting events, but also to reduce our carbon footprint.**

“Our ambition is to go further and increase the focus we bring on the global environmental and societal issues through our content as well. Building a better future, in which we further reduce our environmental impact, is the responsibility of every company and organization.”

“Sustainability is not what we should do. Sustainability is what we need to be.”

Serge Van Herck, CEO



LiveU

With over 5000 clients in more than 150 countries, LiveU is a leader in live video streaming and remote production solutions, providing end to end broadcast services from video contribution to distribution and orchestration solutions with the highest level of quality.

LiveU and Blackbird partner together on a pre-integrated solution that enables production teams to send reliable, high-quality video from anywhere and remotely edit, enrich and publish their live and VoD content to any destination.

“LiveU is increasingly focused on the sustainability of broadcast workflows, and cloud workflows are a huge leap forward towards providing increased value and savings to customers while still allowing for less environmental impact, including reduction in carbon footprint compared to traditional workflows. We really appreciate partners that not only share, but enable, similar values.”

Daniel Pisarski, VP Engineering, LiveU



Sky News Arabia

Sky News Arabia is a 24 hour Arabic news platform. It launched in 2012 and delivers analysis of both regional and international news to more than 50 million households in the Middle East and North Africa.

“If there is a silver lining to the challenging few years we have lived through, it’s that the pandemic has reinforced our sustainability efforts,” says Suresh Kumar, Director of Technology, Sky News Arabia.

“We were looking for a strategic partner to help us drive efficiencies and enhance our screens and digital platforms, while also supporting our sustainability drive and offering flexibility to our remote working staff.

“Blackbird’s cloud native video editing and publishing tools empower our multi-site production teams to collaborate remotely, while minimizing the need for on premise equipment and staff thus ultimately reducing our carbon footprint.”



Eurovision Sport

Eurovision Sport – a division of the European Broadcasting Union (“EBU”) – manages the media rights for 15 sports on behalf of its public service media members, delivering up to 25,000 hours of sport a year through agreements with international sports federations.

Blackbird provides cloud native video editing and publishing tools for Eurovision Sport’s members. This, in turn, enables remote production, removing the need to travel to a facility or event and the need to transit material to and from multiple local storage environments.

“Sustainability is at the heart of everything we do,” says Franck Choquard, Eurovision Sport Head of Content and Services. “Cloud-native production fits the sport very well in terms of what needs to be achieved, while also being both innovative and helping us to reduce emissions.

“With Blackbird as our partner, we are now able to reach more fans in a more effective way and are aiming at being more sustainable within our workflow.”



Conclusion

The evidence of climate change continues to play out before our eyes, with real world consequences that are becoming harder to ignore. Whereas once sustainability was a nice add on, now it's becoming a requirement.

We have already come a long way in a relatively short space of time. Cloud based technologies have enabled a switch to remote workflows that are removing much of the carbon generated mostly by travel to venues for TV and video production.

However, next generation cloud native solutions are showing that more significant carbon savings are possible – by engineering carbon out of production processes from the outset. Notably by reducing the movement of high-res video in and out of the cloud. As cloud native solutions such as Blackbird also deliver cost savings for purchasers, it's a win-win scenario.

Broadcasters and content producers who have adopted these technologies are leading a transition to greener

working methods, without compromising quality for the consumer.

Cloud native technologies make what was once implausible, plausible and sometimes the impossible, possible; delivering not only in terms of carbon efficiencies but also enabling a wealth of other benefits including production freedom, reducing business costs and speeding up workflows.

We are seeing the data points to support the transformational advantages these collaborations can achieve – and there's much more to come.

As these developments become embedded, I believe there's every reason to be confident that video production has an innovative and sustainable future.



Ian McDonough
Chief Executive Officer
Blackbird

Key Findings

- The world is on the path to net zero - regulatory changes will make environmental reporting mandatory.

- As companies vet supply chain emissions, vendor sustainability credentials are becoming critical for competitive differentiation.

- In 2020, 480bn hours were live streamed globally, with 55 grams of CO2 emitted per hour of streaming this is equivalent to the size of Scotland in arctic sea ice loss.

- If we can't reduce consumption, we need to decarbonize our workflows.

- According to Albert, in 2020 one hour of TV production produced 9.2 tonnes of CO2e, in 2021 this fell to 4.4 tonnes – a reduction of 52%.

- Cloud Production Trends research shows that whilst 90% of editors have adopted cloud workflows, 65% use the cloud inefficiently, moving around vast high bitrate files.

- Cloud native video editing is 91% more carbon efficient than cloud based and on premise according to a study by Green Element environmental consultancy.

- A ground-breaking IBC proof of concept, showed 70% less technical infrastructure and power required for live sports production using cloud technology.

- The next step in decarbonizing workflows is next generation technologies engineered specifically for the cloud; they deliver more in terms of speed, lower costs and less carbon.
