# Core Insights

From the experts at The Broadcast Bridge.

# Leveraging Cloud Operations For Live Broadcast

# Introduction by Tony Orme - Editor at The Broadcast Bridge.

More broadcasters are seeing the benefits of moving their operations to the cloud, especially as we are becoming more reliant on remote working. But the transition isn't necessarily a linear move and hybrid working practices help us balance the unique requirements of large media files and the flexibility cloud systems offer.

Flexibility isn't just about improved equipment performance or utilization but also offers the option of creatively thinking about how we deploy teams within a studio facility. This isn't necessarily about reducing staffing levels through improved efficiency but is more about making the teams we have feel better motivated and empowered to make creative suggestions to enhance the production.

Cloud systems provide unprecedented opportunities of collaboration and it's through this collaboration that the creativity of a production can excel leading to greater engagement and satisfaction of audiences and viewers.

Broadcasting is different from many other forms of computer applications as we work with eye wateringly high data rates that are relentless in

their thirst for bandwidth and file sizes that test even the most advanced storage and retrieval systems.

Although it's technically possible to move storage reliant functions to the cloud, and many do, sometimes the workflows demand that storage be localized to the user. This is not always the case though and what broadcast infrastructure designers have learned over many years of experience is that workflows differ depending on the production requirements and needs of the broadcast station.

This is where the technical aspect of cloud flexibility comes into its own. The ability for us to keep operations on-prem or remote in off-prem infrastructures provides us with choices that have never before been available in television.

Also, it might be that we want to provide a hybrid solution where some of the near-line storage is on prem but we back-up to the cloud, or we might use flexible software licensing that allows us to run multiple instances of an application form multiple users on an as-needed basis. Using this method, many of the infrastructure costs associated with the broadcast can be directly related to the

production with minimal up-front charges thus leading to much improved efficiency.

The theory of cloud might be compelling but as engineers we also need to deliver working systems. Cloud adoption has taken broadcasting by storm but it's still an emerging technology and care must be taken in choosing the infrastructure applications needed for your production. Not all software was built for the cloud and to fully utilize virtualization, scaling and flexibility, that is the primary cloud offerings, software must have been designed from the ground up on cloud infrastructures.

Cloud is offering the broadcast community with unprecedented opportunities, but we must remove the shackles of our closed workflow thining to truly utilize its power.

For a deeper dive into Cloud solutions, check out the following articles;

### 1. Cloud-Native Technology Ensures Media Business Success
An investigation into how cloud systems can benefit broadcasters and the key components needed to make them work.

### 2. Leveraging The Cloud Keeps Media Businesses Running Smoothly
A discussion on the business benefits of cloud systems and how to make them deliver for your facility.

### 3. Working Remotely Means Different Things To Different People, But Everyone Benefits
Practical use-case applications are described to show how both cloud and hybrid cloud can benefit broadcasters.

# Part 1 - Cloud Native Technology Ensures Media Business Success

by Michael Grotticelli

As the media landscape continues to streamline the way it delivers content, cloud-native technology, that is, container-based virtualized environments that replicate traditional workflows on premise, is playing a big role. However, some broadcasters moving their assets and processing power to the cloud are performing a simple "forklift," which is often not sufficient to address the types of complex signal processing and infrastructure flexibility required.

With cloud services, workplace productivity is directly impacted. It's faster, so employees spend less time waiting and more time working. The cloud is also accessible virtually anywhere, so it provides an easy way for larger enterprises with multiple locations to share content data. Additionally, working with a trusted partner to manage applications in the cloud frees up internal time to focus on the business.

## Virtualized Hardware Won't Cut It

The current nagging problem, according to Shawn Carnahan, Chief Technology Officer at Telestream, is that a lot of the native solutions content distributors need to successfully move their business and processes into the cloud don't exist yet. When setting up simultaneous transcoding of hundreds of files for example, most virtualized hardware services on the market just don't cut it.

"The real advantages of the cloud can only be realized when you start by building technology specifically for the cloud," he said, adding that processes also must be remotely accessible to the entire team. "What's not working is forklift replacements, that is, taking existing processes and existing software licenses and just moving them into a cloud environment."

## Leveraging Third-Party Infrastructure

Most media companies would prefer to not build out their own infrastructure, capitalize that cost, install it, and maintain it. That's why a virtualized infrastructure is so popular. The first thing that most start thinking about is their data and how much of it they want to release to a third-party service. People see the biggest tangible advantages in cloud storage, leveraging it for business continuity, disaster recovery, system backup, and replacement of tape robots.

With cloud services able to reduce the need for on-premise servers, real estate is freed up for more beneficial uses and energy expenditures are reduced as well. And with pricing going
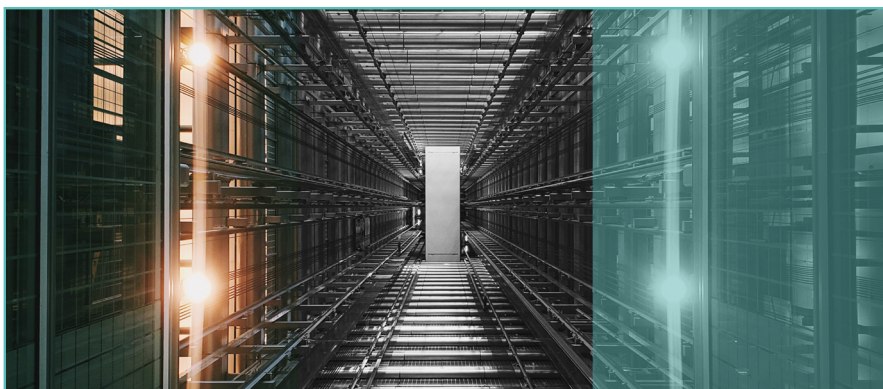
down over time, the cloud is getting less and less cost prohibitive to do. But if the technology you are working with is not cloud-native, you really don't get access to all of things that are possible with the cloud.

"What is working for many that are using the cloud is when they build out natively for the cloud, and use a lot of the technology beyond just infrastructure that comes along with Platform as a Service. Things like artificial intelligence, transcoding, subtitling and tightly scheduled program delivery are all possible once you subscribe to a service."

## Media Services A La Carte

Telestream now offers two SaaS models: one that scales based on the amount of content being processed and a second that limits media processing resources to a fixed amount. Both

models enable customers to order up resources on-demand via a microservices architecture or in reserved instances (a reservation of resources and capacity.

"We've introduced new ways to help customers deal with the unpredictability of service costs," Carnahan said. "One of the advantages of the cloud is near infinite scalability. But thousands of processing tasks done simultaneously can bog down an infrastructure. So, what we can do is restrict the amount of work that you can do concurrently to a fixed set of resources. In this way your costs are predictable. The downside is that if you send in a whole lot of work, we're going to limit how much we do, making the turnaround time for those jobs increase."

However, he said you have to make tradeoffs in regard to scalability, latency and cost—depending upon the delivery model required.

### Content Security In The Cloud
Another important part of any cloud transformation is adequately securing remotely stored content. This should start with a facility developing its own best practices for handing and sharing content. Then it should have a multi-level authentication process in place.

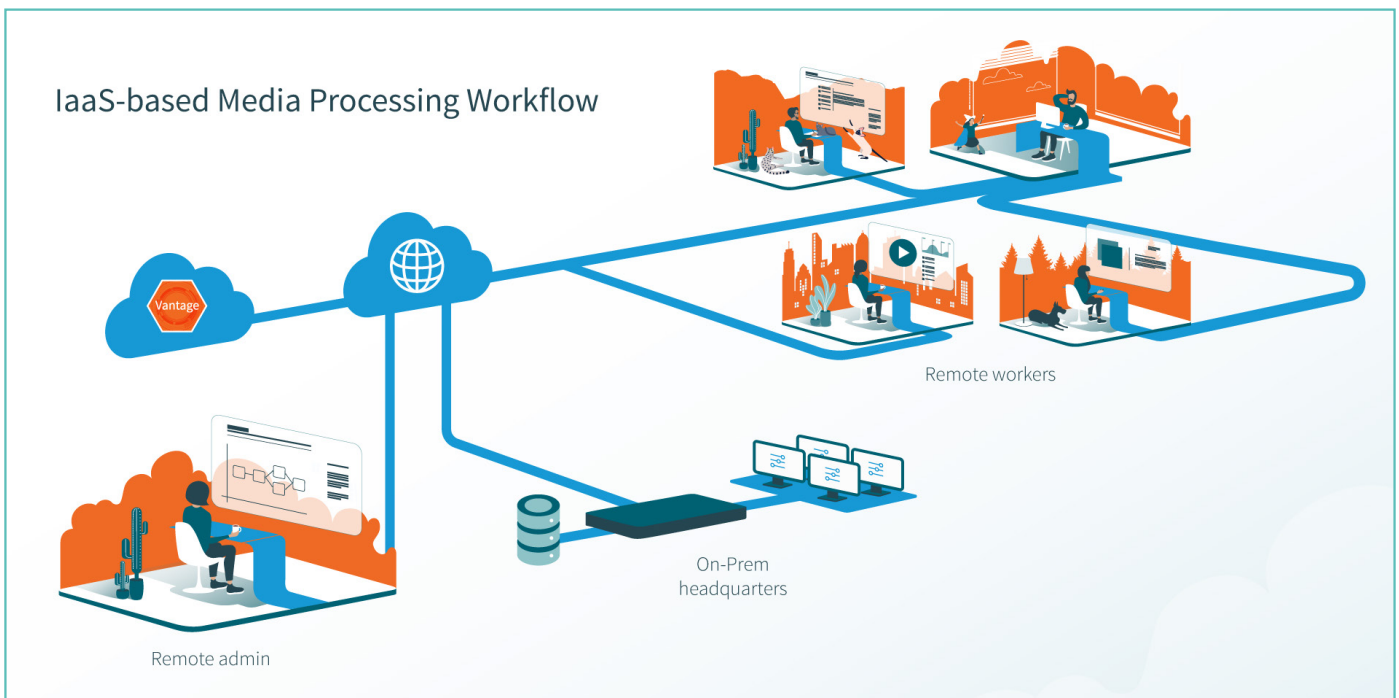"We have customers that told us a year ago there's no way they were moving their most

valuable assets to the cloud," Carnahan said. "Now, people are more comfortable with the level of security that they can get with cloud infrastructures. Most of the security breaches we see are self-induced. Usually it's through bad process or practices that ends up inadvertently exposing content to hackers. This breach often happens not in the cloud but when you are delivering content to third parties."

While most cloud storage is encrypted, Telestream has developed a method for applying a second level of encryption on the assets themselves, which are stored in object storage arrays.

"We don't store your data, we only de-crypt it as we're processing a specific piece of content," Carnahan said. "Also, we never copy content into the VMs that we may be provisioning and using. Basically, we try to minimize the copies of that data that could be compromised. In addition, when you give us permissions in your virtual private cloud we manage your work and infrastructure. We're by far the best equipped to do that."

### Broadcasters Want Vendor Diversity
The other important strategy for Telestream is to be a good partner and work well with other third-party equipment and cloud services from Amazon, Google, Microsoft and others. In



IaaS-based Media Processing Workflow

Vantage

Remote workers

On-Prem headquarters

Remote admin

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addition, Carnahan said developers are looking for vendor diversity. So Telestream is providing services that make it easier for customers to use multiple vendors within a single workflow. This speaks to the company's API-centric approach to cloud services.

"As companies move their data into the cloud, they opt in to a particular cloud provider, and once they move petabytes of data into that cloud service, they are not likely to move it anytime soon," Carnahan said. "That's why we need to be cloud agnostic and operate cross the variety of cloud providers. We operate wherever your data is with the same services, features and pricing, regardless of what storage provider or cloud provider you have chosen to use."

As an example, Telestream's Vantage was initially developed for on-premise service-oriented architectures, allowing staff to program complicated workflows without being a programmer—using visual tools. There are now cloud-native versions (containers and microservices) of Vantage workflows being deployed around the world.

"So, you could start with your data on premise, do some processing locally, and then when it becomes necessary for you to move that data to the cloud, we'll move it up for you and continue processing in the cloud," he said. "Today, most large media organizations have dedicated IT staff that can handle custom programming and development and are building out their own business process systems," Carnahan said. "And they want to consume third-party technology like that from Telestream in a more programming-centric way."

In contrast, for those that want file processing technology but are not Vantage customers, Telestream now offers a fully managed service called Flip, which is targeted at API-driven types of users and features highly scalable cloud-based video encoding/transcoding. This makes it easy to implement and work cohesively with a wide range of service providers.

### Cloud Migration Is Disruptive

"A cloud transition is inherently disruptive to an organization,": he said. "There certainly is a desire to try and forklift as the easiest way of moving things into the cloud and maintaining the investment you've put into business processes. It should come down to 'how do you maintain the outcomes you were getting with your existing processes. And how can you leverage that or relocate that while taking advantage of the cloud and not having to revalidate everything you do.'"

### We're Learning As We Go

"We as a company have had to change along with the industry," Carnahan said. "Part of that transformation is really focusing on being a service company in addition to a product company. In this new world we live in, customers want to consume the processing tasks that we are really good at in a service model. So we've had to adapt to that. What that really means is that we need to be providing outcomes, not software. So, it's not about features anymore, it's about the results."

As broadcasters and media companies adapt to the rapidly changing viewer consumption models, Carnahan said it's important to remember that making the move to cloud processing—for scalability in storage and

compute power; for system redundancy and as a disaster recovery strategy—can be very disruptive to day-to-day operations. But don't be tempted to do it as quickly as possible with the resources at hand.

This cloud transition currently underway within the media industry is coming later than it did for other industries and there's really no playbook on how to migrate. Media customers are trying various things and the vendors that support them are as well. This experimentation has led to a wide range of success stories… and a few failures. But Carnahan said the only real failure is where you don't learn something.

"We're learning as we go," he said, adding that Telestream has been working on cloud solutions for at least four years. "Frankly, many people—vendors and customers—have done things badly on a number of occasions. But others have been highly successful. So it's important to experiment and try new things."

It's clear that moving to the cloud has a direct impact on business costs, with Gartner Research estimating that organizations that have done little-to-no cloud cost optimizations will overspend by 70 percent or more. That's because it opens up the door to increased security, productivity, innovation, and the ability to do more with less. That means broadcasters and media companies can focus on what matters most: Growing their business.



Shawn Carnahan, CTO, Telestream.

# Part 2 - Leveraging The Cloud Keeps Media Businesses Running Smoothly

While cloud computing and storage have reimagined how remote workflows are implemented, they can also play a huge role in business continuity and even disaster recovery. As many major productions have already proven, the key to continued success is extending traditional on-premise workflows into the cloud.

With production teams working outside of their home facility in ever-increasing numbers, remote work, remote production, and business continuity have become more important than ever. Video editors are working remotely more than ever, but what about all of the non-creative work that's required, such as transcoding, making a screener, adding captions, changing frame rates, or creating archives.

The workflow becomes inefficient if those editing workstations (and their time) are tied up with media processing functions. That's why many media companies have moved content into the cloud to remove dependencies on specific locations. This new way of working also facilitates close collaboration between production team members and results in higher productivity and sustained creativity.

Therefore, a critical component of any media business plan is to ensure that users remain productive while maintaining an uninterrupted level of security and control over access to content and related resources. In most cases the cloud can be the missing link to unlimited access.

## Business Continuity
In the area of Business Continuity, the cloud allows media businesses to keep working even though a crew is remotely located. It also allows the organization's staff to have unlimited access to media files as if they were working at the main studio or production facility. Likewise, the same tools that are used to create content "At Home" can be extended into the field and deployed just as effectively to automate high-volume media transcoding and quality analytics tasks.

However, as your media processing system is installed on servers on premise, you still have to remotely log in to the software and applications on those servers. Accessing content from outside a facility often requires arduous security log-in information. So, you have to provide team members with those login tools, and you've got to make sure that any IT firewalls can be addressed.
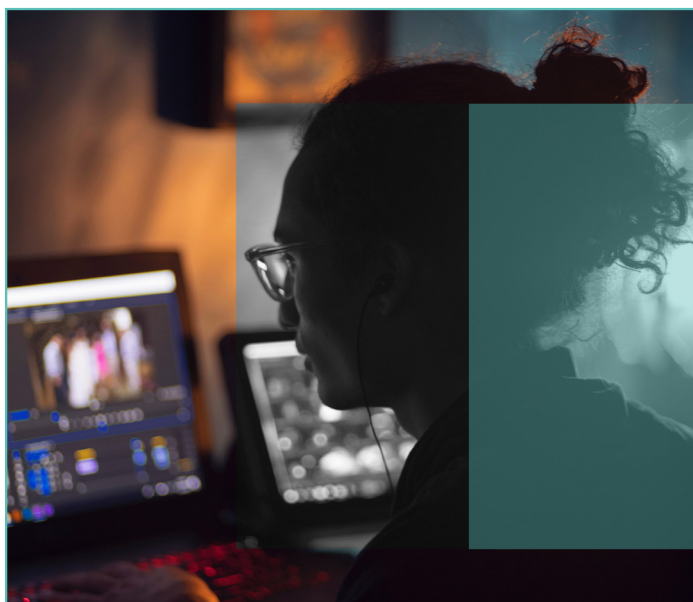


## Automated Media Processing
Once the remote access process has been navigated, producers and editors can begin to run certain aspects of those workflows that process media (change file formats, create captions, etc.) in the background as the team continues its work without interruption. You can also upload an entire workflow and run it in the cloud. Then ABR ladders and a variety of formats can be created for cloud-based OTT delivery to the myriad of media consumption devices in use today.

With a media processing platform like Telestream Vantage, users can work within the IT parameters (firewalls) set by the organization because the cloud-connected actions are actually part of the workflow that's running

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within the firewall. In this way you never have any problems with IT security protections.

With a media processing platform that is instinctively adaptive to the situation at hand, users can perform many transcoding duties with minimal human intervention. This scalable, software-enabled media processing platform can be leveraged to manage all media services from the camera to the point of distribution. It can even allow content owners, producers, and distributors to quickly, easily, and cost-effectively ingest, edit, transcode, QC, package, monetize, and distribute their media.

If you are an employee at a postproduction house who is tasked with QCing content that is being prepped for air, but you're working at home and remotely from the physical media is stored, reliable remote access to media processing can be a lifesaver. Complete remote access and file sharing are also dependent upon available bandwidth. In most cases, that file is going to wind up in a cloud-based archive.

The media processing platform can also be used to free up bandwidth by reducing file sizes and creating proxy files for editors to begin working as soon as a file arrives at your workstation.
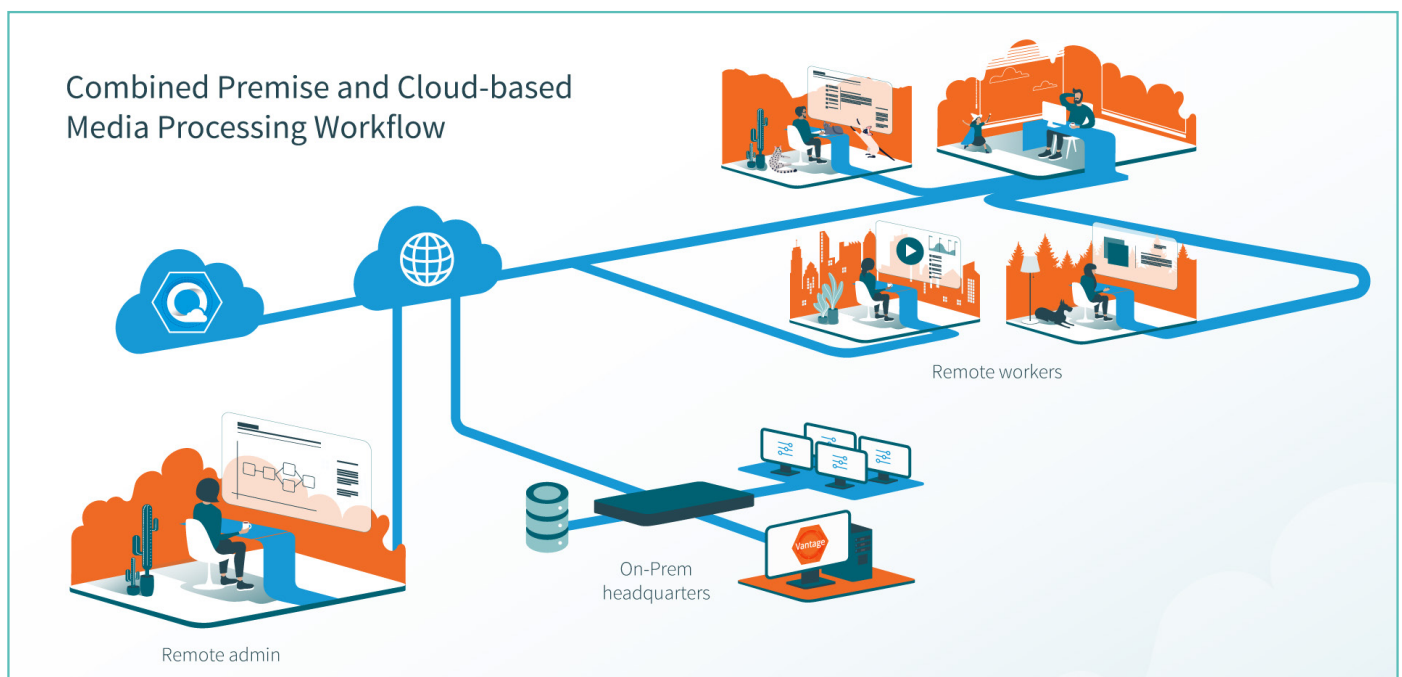
## Viewing Large Files Over The Internet
Another challenge to remote operations is working with very large mezzanine and professional-grade files that are stored in a different location. These huge files can't be viewed over the Internet as is, due to bandwidth restraints. Therefore, in order to view those files, you would have to be physically attached to where they are stored. Because these files can be hundreds of gigabytes or even terabytes in size, workarounds, including creating proxies or downloading, are not viable. Too much time is wasted.

To solve this problem, Telestream has developed "GLIM". Designed for post production as well as ingest QC, engineering, master control, news, and more, GLIM enables media professionals to play full resolution, mezzanine-grade media files from their centralized storage, over the internet, from a web browser.

GLIM was built to solve well-known remote work challenges where remote employees waste hours every day downloading mezzanine grade media files just so they can be played back. Many collaborative video production applications require transcoding prior to uploading to the site. GLIM allows users to play files immediately, from a browser interface, without any delays caused by creating proxies, waiting for massive downloads, or transcoding and uploading to sharing applications. It supports playback, frame scrubbing & stepping and display of file properties and metadata. The GLIM playback experience is vastly superior to remote and virtual desktop techniques.



Combined Premise and Cloud-based Media Processing Workflow

Remote workers

On-Prem headquarters

Remote admin

# Part 3 - Working Remotely Means Different Things To Different People, But Everyone Benefits

**Cloud computing is helping a myriad of professional organizations expand their reach and implement new types of IP workflows that were not possible previously. It has also allowed media companies to work virtually anywhere.**
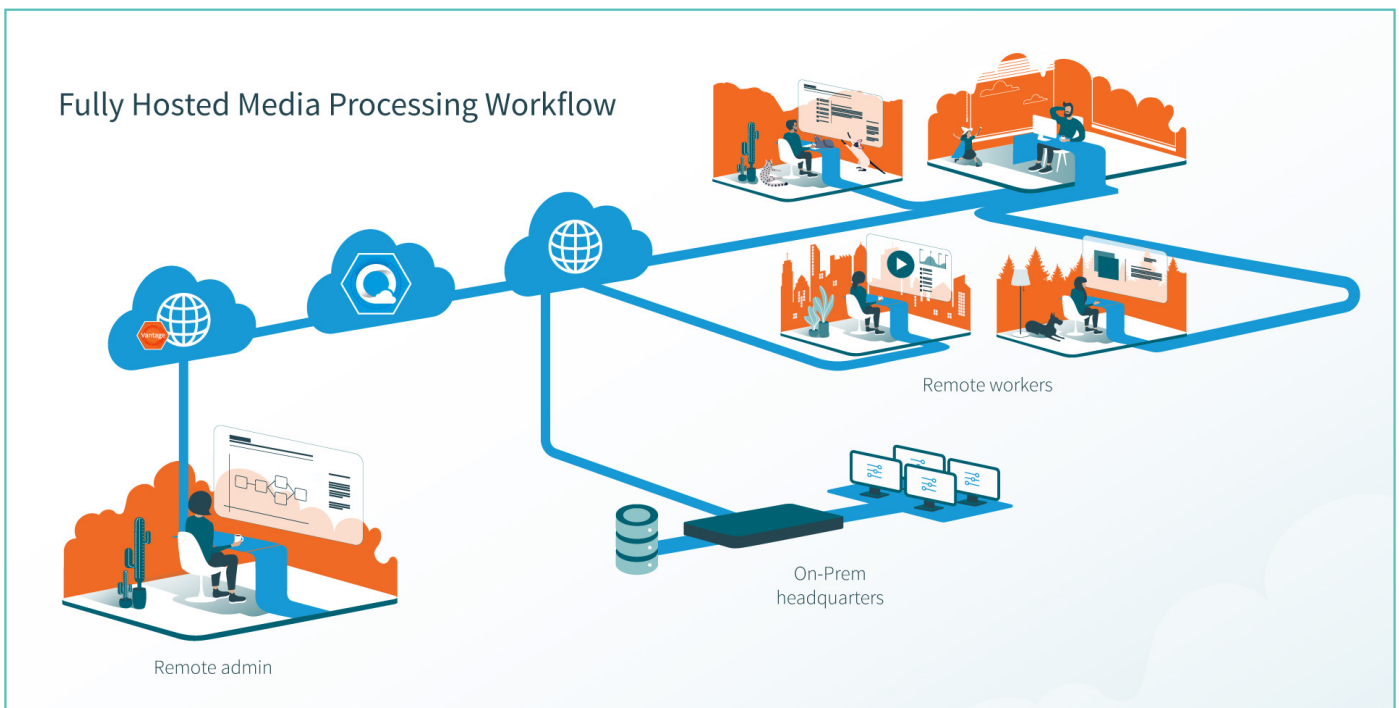
For example, a managed cloud service and an integrated production system can be used as a field-based replacement for a production studio. If your on-premise studio is not available for whatever reason, Telestream Wirecast can be a good live streaming software/hardware replacement. When you need a backup plan fast, this is a very cost-effective way to do it. The system can also help users set up a secure Internet connection. And it will help you understand how much CPU loading you're putting on the machine and whether you are within the parameters to successfully broadcast a live feed over the Internet.

The system is typically used to produce, stream, record and capture a live broadcast or event to a file that can be later processed and delivered in multiple ways.

For example, the UK government is now using this specialized production software on a laptop to broadcast Prime Minister Boris Johnson's daily press conferences to report on the pandemic. At first the press conferences were a weekly update of the government proceedings, but once the virus stuck and commercial business shut down began, the only option was a remote production setup on a laptop. The system now delivers Johnson's message live over the Internet, complete with camera switching ability and graphics insertion. In this scenario Wirecast is acting like a full broadcast studio,—video capture, switcher, graphics and audio—for online delivery over a secure connection.

## Highly Portable Operations

Pharmaceutical companies now regularly produce global all-hands meetings and corporate press conferences in this remote way. One major company uses a single operator with a portable flypack that includes Wirecast Gear (the hardware version), monitors, a robotic camera controller and several PTZ cameras



Fully Hosted Media Processing Workflow

Remote workers

On-Prem headquarters

Remote admin

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mounted around the room. This allows the company to continue its production operations from anywhere they choose—off-site or within the corporate headquarters.

## Alternate Programming

Fox Sports has used Wirecast to produce alternate programming for its Daytona 500 telecast. In order to increase fan engagement and boost the event's presence on social media, organizers create added value for fans, they have created a 4.5 hour "In-Field Party" show that does not include race footage and is distributed online only. It features various celebrities as well as drivers and pit crew managers. The same system has been used to augment past live TV coverage of the Men's and Women's FIFA World Cup soccer tournaments in Moscow and Paris.

## High-End Remote Projects

For high-profile sporting events that utilize multiple broadcast cameras and full production systems, Telestream Lightspeed Live Capture, is a multi-channel on-premise baseband SDI capture solution. It is used to ingest live, live linear or tape-based media directly into production, post-production and broadcast workflows. It can take live HD feeds directly off the camera, ingest them and process them in tandem with a media processing platform like Vantage. This exact remote setup was used during coverage of the Men's and Women's FIFA World Cup tournaments.

During the matches in Moscow, Fox Sports Operations & Engineering was looking to streamline and reduce the cost of its international, bi-directional workflows by sending a single editor to the host cities and

then most raw footage was sent back to Fox's main production facility in Los Angeles. The production teams were able to operate on all files while they were still growing. To support the live event, the team in Los Angeles had to edit content while the match was in process, sending back clips for use at half time and during bridge programs. The operation had to turn around new content within 30 seconds of the live action. Any more delay than that and the production could not meet the audience expectation for live audiences.

These efficiencies were required to support a sophisticated networked infrastructure. Production crews in Moscow ingested multiple HD-SDI feeds per match (with 64 matches in the tournament, over 700 TB of match content was generated over the 30 days of the World Cup). They also ingested two UHD-HDR feeds per match. For all of these feeds they created a cloud-based HLS proxy, as well as high-res AVC Intra in Los Angeles, all of which had to be available to their content management system.

At both FIFA World Cup events, a tight integration was established between up to 22 Telestream Vantage and Lightspeed Live systems and IBM's Aspera FASPStream file transfers to enable high-quality streaming to remote production teams for near real-time editing and production—all over unmanaged networks. Lightspeed Live Capture captured the files and then fed them into Vantage for processing and distribution to related VOD and other platforms. Lightspeed Live Capture runs on a server called Lightspeed Live, which supports simultaneous stream and capture from the same server, so the workflow was fast and seamless.

## Comparing Remote Production Scenarios

As technology becomes more mature and professionals begin to understand remote production better, new types of distributed infrastructures are now being implemented to get the job done.

1. You start with on-premise processing. To get remote access to that content you use desktop applications and log into the servers.

2. You can also extend that capability into the cloud. Now anybody can get access without necessarily having remote log-in privileges.

3. If you do not have Telestream processing on premise, you take a Vantage license and install it on infrastructure in the cloud. Then you simply rent compute power as you need it. However, you don't have the same access to that on-premise storage.

4. The best option is to install "Vantage Workflow Designer" software on-premise. Then you use that cloud extension to create all of the workflows that are all inside the firewall. If you don't have Vantage, you completely host the media processing in the cloud. In this use case, assets reside in the cloud only.

## Disaster Recovery

Disaster recovery is yet another production operations function that can be based in the cloud to great benefit. When your system or critical connection goes down, there has to be a backup or redundancy plan.

Because Vantage can be deployed both in the cloud and on-premise, users of Vantage could duplicate and backup their workflows in the
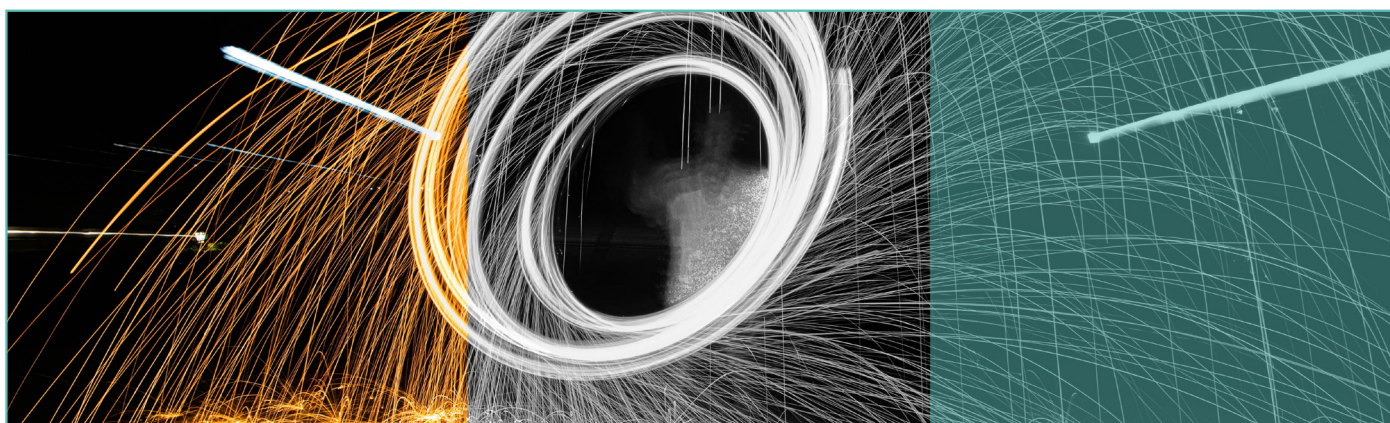
cloud. This way, if your on-premise studio goes down, people are still be able to work remotely using hosted workflows running completely in the cloud.
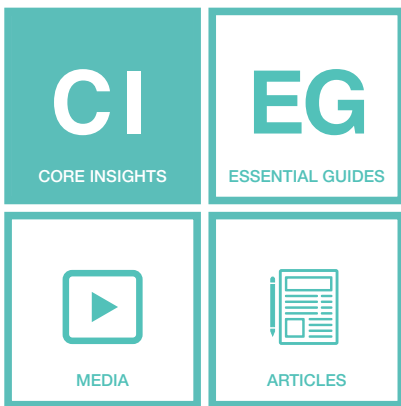
Using Telestream Lightspeed Live Stream software, users could have multiple servers connected so that they act as peers in a redundancy scheme. If one of those servers goes down, a companion server can be brought online automatically, without any human intervention. There's no outbound software necessary to make that switchover. (That switchover is not hitless, but it's useful to keep a broadcaster on the air while the problem is being attended to.)

## In Summary

In order to remain successful in today's highly competitive environment, business continuity and disaster recovery plans should be implemented at every media organization in one way or another. Their To-Do list should include how to leverage remote and cloud solutions for remote working; how to quickly switch to remote production when control rooms go offline or are unavailable; how to execute media processing workflows entirely in the cloud; and how to leverage cloud-based workflows and remote production for disaster recovery.

Workflow disruptions can impact organizations of any size in any location. From weather, to power outages, political events or even virus outbreaks, every organization needs to develop a business continuity plan to ensure its business operations can continue, no matter the disruption. Implementing carefully considered strategies for dealing with a last-minute change in venue or a system failure will go a long way towards maintaining reliable and lasting business continuity.