# OTT Monitoring

# Essential Guide

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ESSENTIAL GUIDES

# Introduction from Telestream

Hello, welcome to this Essential Guide on OTT Monitoring, supported by Telestream.

Telestream and The Broadcast Bridge strongly feel that there are new business models to be realized and markets to reach using Over-the-Top (OTT) video content distribution. Regardless if you are a new player in the market or if you are a long-time broadcaster or content owner, OTT must be part of your plan to retain existing customers and attract new audiences.

OTT has and continues to change the landscape for broadcasters and consumer alike. Broadcasters and other video content providers now own the user experience, and users expect rich and entertaining content with minimal or no interruptions wherever they are, whenever they want. As with any technology driven shift, the OTT market yields great opportunities as well as a new set of challenges. Understanding the challenges and how your business can thrive in this time of transition is critical to successfully leveraging the benefits of a direct-to-consumer product.

The series of articles in this Essential Guide, including the Telestream authored Customer Perspective content, provides a comprehensive overview of OTT video distribution networks and the real-world challenges that providers face. For any single piece of content to reach a paying viewer, streaming video often has to traverse content preparation and distribution networks that are owned and operated by different entities. Done well, each organization specializes in a critical function of the process - resulting in a smooth customer experience and new market opportunities for broadcasters.

More often, the silos create communication challenges, blurred lines of accountability and overall lack of visibility to the entire process.

There is an implicit need for broadcasters to monitor their content across the entire video lifecycle of content preparation, distribution, all the way up the point of consumption; be that in the home or on the move. In the fight for eyeballs, video quality assurance is critical.

Matthew Driscoll, iQ Product Management Director, Telestream

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Supported by

# OTT Monitoring


By Tony Orme, Editor at The Broadcast Bridge

## Part 1 - Understanding OTT Systems

**In this Essential Guide, we investigate OTT distribution networks to better understand the unique challenges ahead and how to solve them. Unlike traditional RF broadcast and cable platform delivery networks, OTT comprises of many systems operated by different companies to deliver programs to viewers, and it's these potential silos that are the root of the challenges OTT faces.**

To enable delivery to a multitude of mobile devices such as phones, tablets, and laptop computers, OTT distribution systems provide multiple data streams with varying data-rates. A viewer travelling may move in and out of good cellular coverage. Or a Wi-Fi network in a coffee bar may become congested as more customers arrive, and the available bandwidth is compromised.

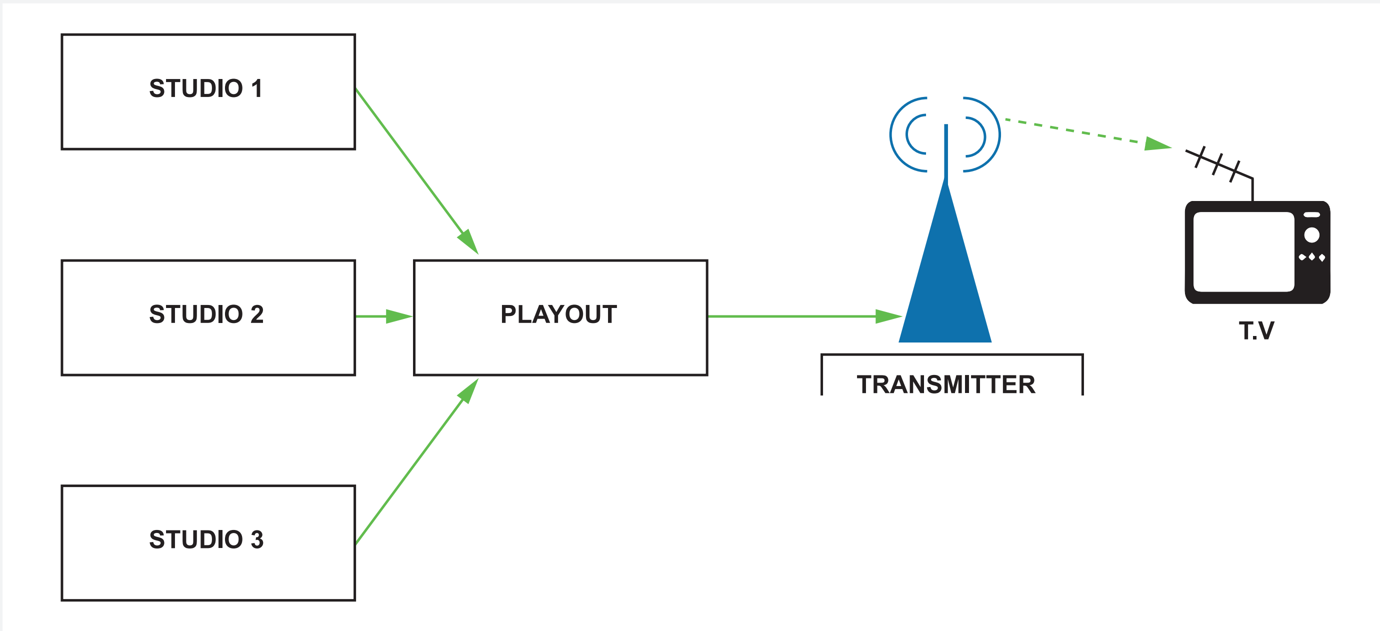


Figure 1 – traditional broadcasting is a unicast distribution system where signals are actively pushed to a television receiver. The TV always receives the signal and the transmitter has no knowledge of whether a viewer has received the signal or not. OTT relies on the receiver, such as a mobile or playback, device actively requesting data from the broadcaster.

Using adaptive streaming protocols such as DASH (Dynamic Adaptive Streaming over HTTP) or HLS (HTTP Live Streaming), multiple streams are provided to accommodate availability of network bandwidth. For an HD service, there may be five data rates varying between 500Kb/s and 5Mb/s, for example. Mobile devices compliant with DASH and HLS receive a manifest file describing the different available streams. The mobile device uses this information to automatically switch between data-streams.

## Best Viewer Experience

Ideally, the mobile device will choose the highest available data-rate stream as this will deliver the best quality picture and sound. However, if the user moves into a network with poor coverage the data delivered will not reach the mobile device in time and buffer underruns will occur, resulting in the infamous “buffering, please wait” icon, thus seriously affecting the viewer experience.

The mobile device needs to keep its own internal buffer optimized to maintain a good level of quality of experience for the viewer. If it is too low, or empties, the picture and sound may freeze and break up. However, compliance with DASH and HLS allows the mobile to detect low buffer levels and calculate the bandwidth available and switch to the highest stream available to keep the buffer full. This compromise may deliver slightly lower quality video, but the quality of experience improves significantly for the viewer.

## Switch To The Best Data-Rate

If the mobile device detects higher data-rates are available from the network, it will switch back to the higher data-rate stream thus improving the quality of video and audio. All this happens automatically without user intervention.

At this stage, it’s worth remembering that broadcast television traditionally relies on sending a single data-stream per channel in one direction, from the broadcaster to the home. When the signal leaves the transmitter antenna, we can happily assume the signal is being received by the viewer.

Broadcast networks are either closed, that is owned and operated by the broadcaster, or signals are transferred over a private telco network directly contracted to the broadcaster. Either way, the broadcaster has complete visibility of the unidirectional broadcast from the TV station to the viewer at home via private telco networks and RF transmitters.

## OTT Flexibility

Similar analogies and assumptions can be made about broadcast distribution using cable delivery. The network is closed, either completely owned by the broadcaster or directly contracted to private telco circuits by them.

OTT does not operate in this way.

OTT is incredibly popular from the viewers perspective, as they can access the material via the internet. But there are many third parties involved in the distribution network that the broadcaster either has no control over or little influence over.

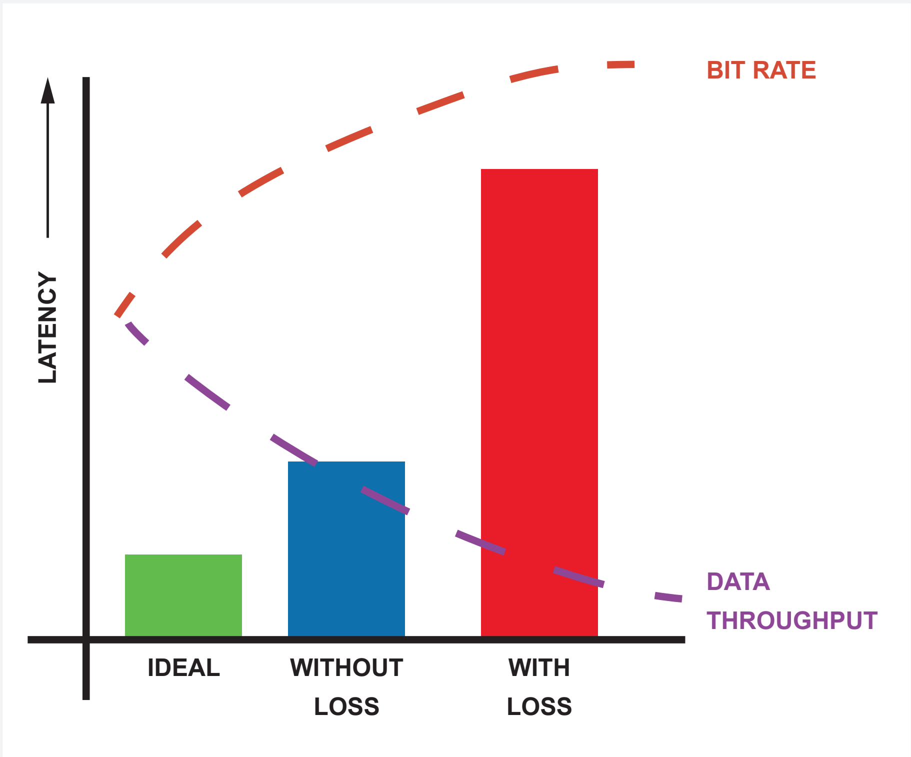


Figure 2 – HTTP data is transported on TCP. Due to the operation of TCP, there can be unintended consequences if large errors occur. Although the bit data-rate on the wire increases, the data-throughput decreases, and its latency further increases. Care must be taken when interpreting just the bit-rate in a network.

When leasing a dedicated SDI circuit from a telco, a broadcaster can be certain that the circuit meets certain stringent requirements such as bandwidth and jitter. These will comply with SMPTE's 292M specification for example. The broadcaster can be sure the telco will route the signal to its destination with virtually no delay and completely intact in accordance with the specification. The disadvantage of this system is that it is incredibly expensive, restrictive, and offers little flexibility. There is no easy way of sending a program to a mobile device using transmitters and SDI networks.

## IP Is Transport Stream Agnostic

Internet Protocol (IP) has emerged as the dominant delivery mechanism for the internet as it is transport stream agnostic. IP can be as easily distributed over Ethernet as it can over Wi-Fi, the IP packets have no knowledge of the underlying transport medium. However, IP was never designed to be fault tolerant but instead is a best-effort-delivery system.

To deliver fault tolerance we use Transfer Control Protocol (TCP), this uses a windowing system to guarantee groups of packets are received by the destination. If the receiver doesn't send an acknowledge or it isn't received by the sender, then the group of packets is resent. This adds some delay and latency, but it's not the full story.

## HTTP Transports Video And Audio

Internet web-servers use Hyper Text Mark-up Language (HTML) to provide the data and information for web-browsers to display. In turn, HTML web-pages are transported between web-server and browser around the internet using Hyper Text Transfer Protocol (HTTP). And HTTP resides on top of TCP and then IP.

Although IP forms the basis of packet delivery for the internet, it's HTTP that is the basis of application delivery and distribution for web pages, streamed audio and video. HTTP was chosen by the designers of DASH and HLS to transport video and audio to mobile devices as it forms the backbone of the internet and is interoperable (in theory).

From a service providers perspective, HTTP is incredibly useful to their business model. For example, a third-party Content Delivery Network (CDN) provider can spread the cost of their facility over many clients all using HTTP. ISP's adopt the same model and it is this sharing that makes program delivery both flexible and cost effective for broadcasters. Being able to deliver to mobile devices gives them much greater audience reach.

## HTTP Provides Flexibility

The ability for broadcasters to be able to use HTTP delivery over shared networks is what makes OTT so flexible. But with flexibility comes challenges and compromise. Reducing flexibility merely takes us back to dedicated privately leased SDI networks.

Consequently, broadcasters now find themselves sharing networks with other service providers and users. These networks are incredibly complicated and not dedicated to any single client. This leads to compromise on the part of the service provider as they do their best to keep all their clients happy.

These highly complex networks are dynamic, and their behaviors can be influenced by other users in the system. If a mobile phone operator suddenly issues a software upgrade and millions of users all download it at the same time, this could affect the network and influence the quality of experience of broadcast viewers. Especially if the proper safeguards within the network haven't been implemented.

## Silo Thinking

In a typical delivery channel, many service providers may form the link between the broadcaster and the viewer. Different suppliers provide geographically separated distribution through CDN and many ISP's and Access providers deliver the end program to the viewer. This developing model has led to silo thinking and establishing who is at fault, should an error occur, can be a complex and demanding task. The blame-game and finger-pointing culture soon establishes itself with self-defeating consequences.

From the viewers perspective, OTT is a solution in its infancy. Furthermore, many vendors are still experimenting with delivering optimal methods of service provision. New architectures and protocols are constantly being developed to improve the viewer experience.

## Optimization Incompatibility

Working within the confines of their own laboratory environment, a company may find it has been able to improve video delivery by designing a new architecture or optimizing a protocol. It's only when they connect to another service provider, they may find that their solution is not completely compatible. And these changes are not always advertised so even establishing a modification has occurred can be difficult.

Some events create enormous loads on a delivery network resulting in non-deterministic and unpredictable behavior. Broadcasters cannot always predict how many viewers will use OTT in preference of traditional broadcasting so understanding where extra resource must be provisioned provides its own challenges. Mainly due to the interaction of many differing elements from unrelated service providers.

With todays social media savvy consumers, many dissatisfied viewers resort to social media to vent their anger and dissatisfaction. Brands are easily damaged, and valuable revenue lost. With a plethora of alternative sources of programming, viewers seamlessly switch to other program providers.

## Faults Are Complex

It's not unheard of for broadcasters to be monitoring social media feeds to establish the quality of their delivery. Clearly this is unsustainable and does not provide a sustainable business proposition.

Due to the complex nature of real-time live broadcast television delivery, it's time-sensitive and fault-intolerant. Many things can go wrong in many locations and a seemingly obvious fault manifesting itself with one service provider, may in fact be caused by another service provider, without obvious reason.

## Part 2 - Why We Need OTT Monitoring

**Even delivering an OTT unicast program to a mobile device or player requires a bi-directional data path between the broadcaster and the viewer. And this is one of the reasons OTT can provide many challenges for broadcasters, especially when multiple service providers are involved.**

There are five distinct technical areas in the OTT delivery chain; content provider or broadcaster, content preparation and origin services (also known as the headend), private or 3rd party CDN's, Mobile/Wi-Fi/Broadband access points, and the user device (laptop, mobile phone, notepad).

The broadcast is made available by the content provider, but it is the user that initiates the transmission and delivery.

### OTT Format

Content leaving a broadcaster is first encoded and transcoded into multiple streams required by DASH (Dynamic Adaptive Streaming over HTTP) and then segmented and packaged. The segmentation takes a continuous stream of video and audio, and partitions it into small HTTP-based files with each segment representing a short interval of playback. The mobile or playback device assembles the segments to reconstruct the video and audio.

Packaging includes creation of the manifest files to describe the streams, and construction and compliance with the DASH standard. Other protocols such as HLS (HTTP Live Streaming) operate in a similar manner to create segmentation and description files.

### OTT Segments Filestreams

The concept of segmentation is important to broadcasters as it demonstrates a break-away from the traditional RF transmission and cable type distribution and infrastructures. These rely on a unidirectional, continuous data-stream sent to the user. Segmentation, as the name suggests is separating the continuous program data-stream from the broadcaster into individual files that can be distributed. These are transferred not only on an IP network, but more importantly, on an HTTP compliant network.

HTTP compliant networks, such as the internet, allow users to watch OTT programs on their playback and mobile devices.

After segmentation and packaging, the resulting files, or chunks, are sent by the headend to the CDN, or if multiple CDN's are used, the chunks can be stored in an origin server within the headend. If only one CDN provider is needed, the headend can send the files to the CDN which in turn distributes and stores them on the edge servers as required.

### Playback Requests Data

Again, this is where traditional broadcasting differs from OTT as it is the responsibility of the playback or mobile device to request the segments and manifest files from the origin server or CDN edge server.

A playback or mobile device works on the request-and-supply model. When a viewer selects a media streaming website, the media player within the viewers device tries to maintain an optimum level of buffer capacity. If the buffer is too low, the playback engine runs out of data and the pictures and sound will break up. If the buffer capacity is too high, then unnecessary latency occurs.

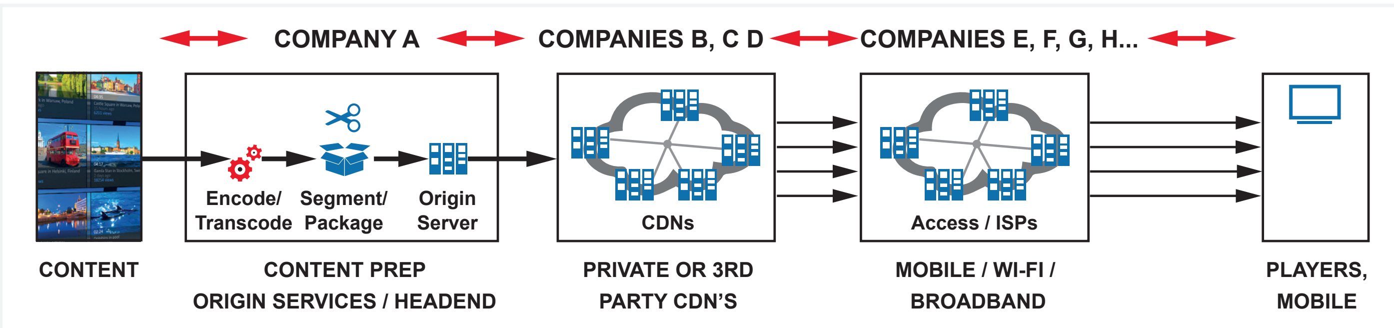


Figure 1 – A playback chain consists of five distinct points of demarcation, but even these can be further divided by multiple vendors.

## No HTTP Multicast

Although multicast transport protocol research is now a hot topic, currently, there is no provision for multicasting in HTTP networks such as the internet. As HTTP uses TCP, and TCP establishes a software logical connection between the playback and mobile device, and the streaming server, there is in effect a direct connection between them resulting in a one-to-one mapping. This restricts the ability for the internet to provide a one-to-many mapping as in traditional RF and cable transmissions.

Also, web-servers are stateless. That is, when a browser requests a web page, it ultimately includes in the request the IP address of the web-server and the IP address of the player and mobile devices to establish a connection. When the web-server receives the request for data, it responds with the two IP addresses reversed. Once the data has been sent, the webserver forgets that the requesting player or mobile device exists. In other words, it does not hold any information about which files, or how many, have been sent to the browser, hence it is stateless.

Web video and audio streaming operates in the same manner. It is the responsibility of the playback or mobile device to continually request the next segmented package of files from the server nominated by the headend.

## Mobile Device Initiates Streaming

Understanding the demand-and-supply nature of playback and mobile devices is critical to understanding the reason for using CDN's.

As an example, consider a single stream distribution network without a CDN solution; a viewer wants to watch a baseball game on their mobile phone. They log onto the website through Wi-Fi via an ISP, and the playback engine in their mobile phone starts requesting segmentation files from the headend origin server. The origin server is constantly being fed with new segmentation files from the studio output, encoder, and packaging engine.

The origin server has no knowledge of the existence of the viewer or their mobile device so does not actively send them any video or audio. Without any viewers the origin servers' storage would just fill with segmentation files (after some time, they would be purged by a housekeeping program) and they wouldn't be sent anywhere. The origin server relies on the mobile device actively requesting the next segmentation file in the program sequence to fill the mobile phones' buffer and playback the game.

Even in our simple example, it's possible that the ISP may buffer the files in a proxy server somewhere within their own network. Neither the broadcaster nor the viewer would have any knowledge of this. Such a configuration should be transparent. However, it could increase latency or be another point of failure.

Assuming the network is behaving properly, the origin server would happily service segmentation file requests from the single mobile device. However, if multiple users started to also watch the game and request segmentation files, a tipping point soon occurs where the origin server does not have the internal resource to service all the file requests and will slow and ultimately become unresponsive. This results in the user receiving a poor quality of experience, that is, they would no longer be able to see their game.

## CDN Alleviates Network Congestion

One solution is to increase the number of origin servers and add load-balancers to them so that many playback and mobile devices can request files simultaneously. But this makes inefficient use of the network bandwidth. If many of the users reside in one geographic location, then one data stream per user exists, resulting in efficient use of the network and potentially causing sever congestion. Especially as the data carried over the network for each mobile device will be virtually identical.

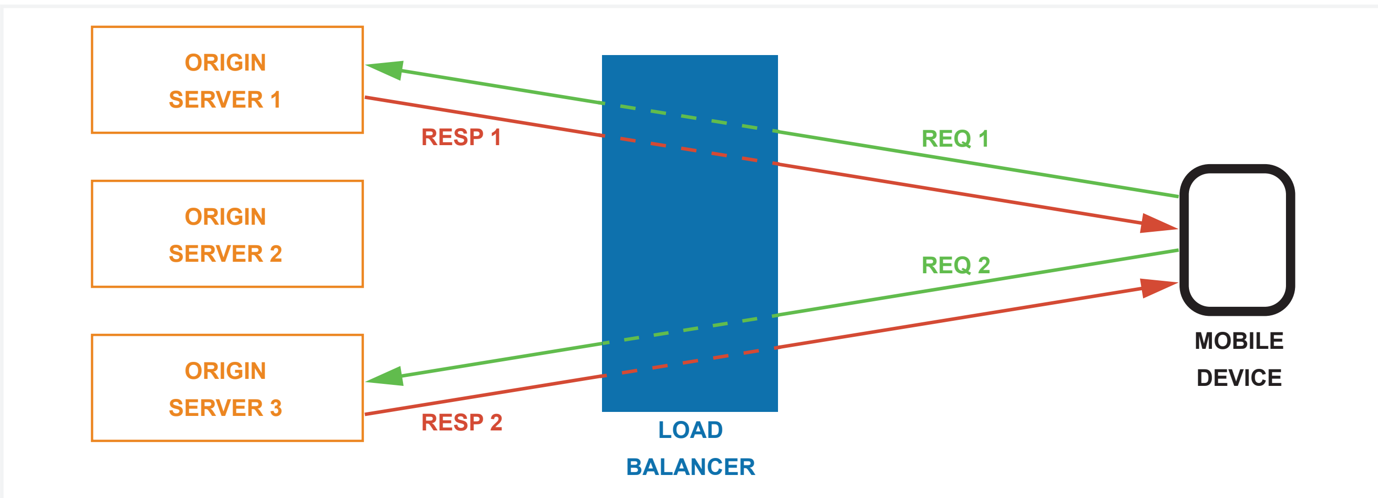


Figure 2 – A load balancer distributes segmentation requests so that load from many devices can be spread across multiple servers. As the servers are "stateless" they only need to respond to each request one at a time and do not need to hold any history of the previous requests.

The CDN alleviates the network congestion issue. Multiple streaming servers are strategically placed in geographical areas within the vicinity of the users. These servers are called edge servers. This server distribution model decentralizes computer processing, significantly reduces network traffic as there are fewer devices requesting files from the headend origin server and reduces the load on the origin server at the headend.

If only one CDN provider is used, then the broadcaster may dispense with their own origin server and send the segmentation files directly to the edge servers within the CDN network from the broadcasters headend.

## International Events

If the broadcaster is distributing an international event, such as the Olympic Games, then many users in countries throughout the world will want to view the program. It's unlikely that one CDN provider will service all countries and each country, or group of countries, will have their own preferred CDN provider. With this model, the broadcaster will go back to providing an origin server, or group of origin servers, to facilitate the demand from the edge servers for each countries' CDN.

What started as a simple OTT example has suddenly become incredibly complex with a whole multitude of service providers throughout the world. As the network grows, the broadcaster has less control and influence. But they are still responsible for making sure the viewer has an outstanding quality of experience. If they do not, then the viewer may switch channel, or take to social media to vent their anger, thus potentially damaging the broadcasters' brand and revenue.

## Viewers Demand Reliability

As well as understanding a highly complex network, the broadcaster now has an indeterminate number of dynamic challenges to also deal with, and potentially many service providers blaming each other for problems. The geographical location of faults heavily impacts on the number of users affected. The viewer doesn't care whose fault it is, they just want to watch their program.

ISP, CDN, headend, intermediate streaming servers, and edge servers all interact with each other dynamically and sometimes unpredictably. The law of unintended consequences might imply a fault is occurring at a location unconnected with the point in the network where the problem is manifesting itself. A fault might even randomly appear to move around a network between different service providers.

Consequently, as OTT has increased in popularity, its complexity has risen exponentially. And understanding what and where to monitor is critical for a broadcaster to maintain their brand and revenues.

## Part 3 - OTT - What And Where To Monitor

**In this concluding part, we look at what and where to monitor in a multi-service-provider OTT delivery system.**

Quality of experience (QoE) is the key deciding factor in designing a monitoring infrastructure. We have already seen how a seemingly simple challenge of delivering a live sports event to IP playback or mobile devices, soon becomes incredibly complex.

The key aspects of QoE for the viewer are stable pictures and distortion free sound. Even the slightest audio clicks, or picture freeze can leave viewers disgruntled and looking for an alternative source of entertainment, resulting in lost revenue for the broadcaster.

### Start With Video And Audio

Video and audio leaving the studio is the first point of monitoring. The usual video and audio levels must be checked to confirm they are within specification and that there are no freeze or black frames. A single video and audio stream may be compressed to deliver five or six different bit-rates to comply with DASH and HLS protocols. Excessive noise or out-of-specification signals can have a devastating consequence during this process.

QoE further leads to calculating and establishing the Mean Opinion Score (MOS) to represent the quality of the system.  This is the arithmetic mean over predefined scale to establish the performance of the video and audio quality. MOS scales range from 1 for bad, and 5 for excellent.

Any SCTE35 ad-insertion markers must be checked to verify the data is correct leaving the broadcaster. Also, compliance with closed caption and audio loudness must be established and that HDR metadata is valid. The streams can also be decoded and compared to the original to confirm they are good at the headend before moving to the distribution network.

### Headend Monitoring

Monitoring must be added post segmentation and packaging to make sure the file chunks and manifest files are correct and comply with the relevant standard. At this point the files are pushed to either the origin server or directly to the CDN edge servers depending on the model adopted by the broadcaster. Again, these files must be monitored to confirm they are arriving at the server in good time, are intact, the right size, and that the bit rates are correct.

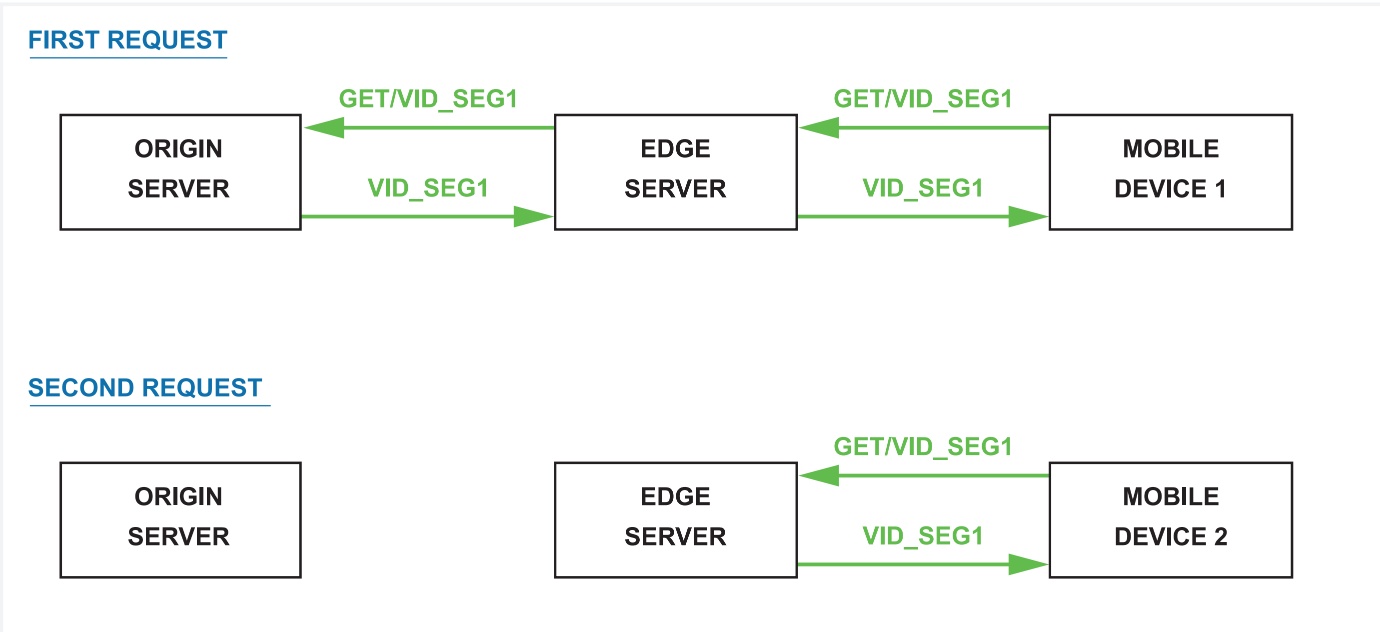


Figure 1 – When a mobile or playback device requests a chunk from the edge server, the edge server requests the chunk from the origin. It then stores the chunk in the cache so that when the next device requests the segment it's available locally without the request having to go back to the origin server. If the edge server's cache is too short, that is it deletes the chunks prematurely, any subsequent devices requesting a chunk that should be cached will force the edge server to request the chunk again from the origin server. This adds unnecessary load to the origin server as well as increasing the load on the network bandwidth.

The CDN edge servers should hold just enough file chunks and manifest files to service the playout and mobile devices. Unlike traditional RF and cable broadcasting, the playout and mobile devices are not synchronous, each device is free running and requests data from the edge server at a different time.

If the CDN edge server has not been correctly configured and it's not caching effectively, it may find it cannot service a chunk request from the playout or mobile device. The edge server then requests repeat chunks and manifest files from the origin server. If this occurs regularly or for many devices, excessive load on the origin servers results as well as unnecessary data bandwidth consumption on the network. Again, there is a compromise because if the caching was too big, then excessive latency would occur.

Intelligently monitoring the data flow between the edge and origin servers is critical. It's not just a matter of monitoring data-rates as the information provided is limited. We need to know if multiple chunk and manifest file requests are occurring and how often. Therefore, the monitoring probe must be able to understand the DASH or HLS protocol to determine if an error is or has occurred.

Furthermore, monitoring correlation across multiple bit rates and multiple protocols such as DASH and HLS is incredibly difficult, especially if they are spread over several silos. Understanding the source of these errors is essential to truly understand where they originate.

Low level protocol data errors must also be checked. TCP is very good at masking underlying link or device errors. By its very nature, it will continue to resend packets if the receiver either does not receive or acknowledge them. Monitoring just the data-rate will not help as the TCP protocol will continually resend data packets so the bit-rate looks good, but the data throughput is very low. These errors may occur on one CDN but not another. Unless adequate rate-shaping is applied to a server, a misbehaving TCP link can easily consume disproportionate amounts of bandwidth resulting in the loss of other services.

## Consuming Bandwidth

An origin-server may easily provide six bit-streams with varying data-rates for an adaptive distribution, each of these will ultimately be a TCP connection, if one of them misbehaves and consumes the link bandwidth, all the other streams will cease to work. Normal bit-rate monitoring may not easily detect this situation as the bit rate will be correct. So specific DASH and HLS aware monitoring must be used.

Load-balancing is the process of distributing HTTP messages to origin-servers to evenly distribute the load processing between them. In a virtualized environment, new servers can be quickly added to respond to peak demands and removed once the event is complete. Monitoring the connections to the load-balancer will soon expose requests that are not being correctly responded to, or excessive latency.

Monitoring at the data level is often referred to as Quality of Service (QoS). Importantly, this doesn't require decoding into audio and video as we can make some assumptions about the integrity of the video and audio based on the delivery and progress of the chunks and manifest files.

Some CDN providers give monitoring access for broadcasters to allow intelligent monitoring during the signal path. This allows broadcasters to measure the chunk and manifest files to confirm they are progressing through the chain correctly. If this service is not available, then the broadcaster is able to add intelligent monitoring before and after the CDN.

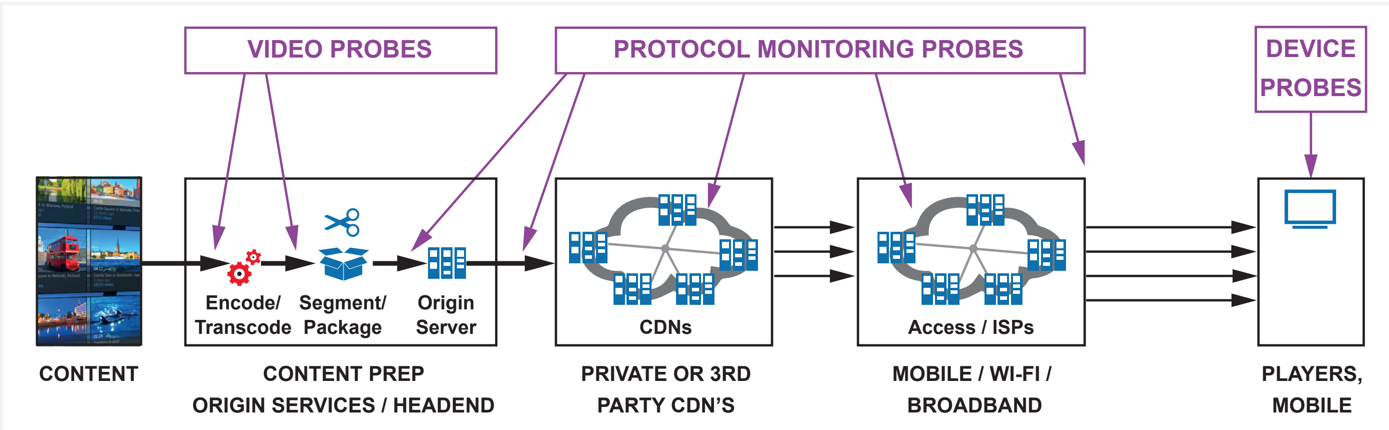


Figure 2 – Adding a combination of media probes and intelligent monitoring is key to building a successful infrastructure, especially when many service vendors are involved.

## Improvement Through Collaboration

Although it may seem counterintuitive, that is a CDN provider would provide monitoring, what is becoming clear is that if a CDN provider can quickly demonstrate their system is working correctly, then the broadcaster can look elsewhere to determine an error. More and more CDN service providers see the benefit of collaboration and are now working together to provide intelligent monitoring tools to deliver a better service, thus breaking down the silo culture.

Further monitoring can be added to the Access and ISP points to analyse the final point in the chain. Bringing all the monitoring back to a central resource for the broadcaster now delivers an incredibly detailed, proactive, and efficient monitoring system. Broadcasters can quickly determine if an error has occurred and have deep insight into the network to understand where it has occurred.

Maintaining QoE is paramount to keeping viewers engaged and watching programs. And now, data-analytics companies can determine if a playback or mobile device is providing a good QoE for the viewer. The software probes can determine if a DASH system is constantly switching between streams and why, for example. They can establish if there is buffer underrun, or poor network coverage.

## Understand Who Is Affected

Companies must understand the interaction between their respective points of demarcation now. The impending migration to virtualized infrastructures and cloud makes this kind of monitoring critical.

Being able to understand whether a problem has occurred at the headend, CDN, or access network is incredibly powerful for a broadcaster. Establishing who was affected, how often, and when, will help broadcasters quickly fix a fault as well as deal with any resulting viewer fall-out.

But the end game is to be able to detect problems before they become apparent to a viewer so they can be dealt with quickly. As intelligent monitoring drives deeper into multi-service provider networks and facilities, problems will become established more quickly, and more importantly, the silo culture will diminish as service providers collaborate further.

# The Sponsors Perspective

## Broadcasters Now Need To Care About Quality Viewing Experiences

By Matthew Driscoll, Product Management Director at Telestream iQ

Thanks to Over-the-Top (OTT) streaming video, content owners and broadcasters have a very different relationship with the end consumer – often a direct one.

In the past, viewers experiencing problems contacted their service provider of the content to find out what was happening. And there was typically an expectation that the whole experience was trouble free. Traditional TV services have become so reliable that we expect them to "just work" – almost at the reliability level of a light switch. Turn it on, and my highly anticipated video is right there for my viewing pleasure. In the event of problems, broadcasters did not need to deal with the quality of the viewing experience because they did not own that relationship. With OTT streaming video, now they can, and more often do. Broadcasters must be prepared to deal with content quality and delivery issues, which means having the necessary tools to determine what is happening with their content from the point of origin all the way to their customers' viewing screens.

While a direct to consumer streaming service can open vast new audiences and revenue models for broadcasters, bad experiences can result in customer loss and damage to their brand. The demand for OTT delivery is a natural opportunity for growth, and broadcasters need to be aware of their customers' experience. Video streaming quality is essential. The shift from live linear TV to a streaming video service doesn't change consumer expectations – it must work.

Ensuring the experience for the viewer is a challenging task – UltraHD/4k, HEVC and HDR add processing complexity, delivery networks may or may not be optimized for video, access networks vary in quality, home networks are anyone's best guess, and there are growing numbers of consumption devices. The challenge is very real. This dynamic OTT environment and the customer experience can come in to focus with a proper video quality assurance architecture. For any broadcaster with an OTT strategy, monitoring is not an option – it is essential.

The market is only slowly becoming aware of the value that video quality monitoring brings and the importance of the viewing experience. Telestream iQ developed its first monitoring solutions over eight years ago, but it has taken the relatively recent entry of new players to put a spotlight on this key QoS and QoE enabler, which, for these players, is clearly tied to subscriber churn.

## Video Monitoring Strengthens Your Brand

Consumer churn is a key issue and the cost of switching providers has never been lower. Consumers can access enticing content from several sources: if the quality of experience with one provider is lacking – for example, if video playback suffers from delay – then the consumer will quickly move on to another provider. Simply download a new app, sign up for a free trial and start streaming. To make things worse, video abandonment and subscriber churn can happen without ever getting a call from your subscriber. You lose a customer and don't know why or how to stop others from doing the same. This is the brutal reality of today's market economics – superior streaming experience is critical in maintaining customer satisfaction and reducing customer churn.

Proactive OTT providers want to ensure that their streaming video services are available and of high-quality before they launch, and the quality is maintained during broadcast. For example, one content provider in Europe offering a stream service of live sports events wanted to make sure a high-quality experience for a large portion of their subscriber base located in Japan. Using a holistic approach for video quality assurance, the content owner was able to monitor, analyze and assure the quality of experience ahead of the event starting. Once the stream started, they could evaluate the streaming quality of the entire event across the whole distribution network.

This investment in a high-quality video experience is a key component of Customer Experience Management (CEM), which is a rapidly evolving discipline. The bottom line is that if the consumer is happy with the service they experience, then they are more likely to invest in additional services from that provider. A video service assurance solution with viewership information enables insights to customer experience and allows you can quickly triage video and network-centric impairments based on the audience that is affected. By using end user viewership data your teams can be hyper focused on only the most critical problems. Let's face it, you have a lot on your plate. So, addressing the issues with the largest impact on viewership allows you to spend valuable resources wisely to protect your customers, investments, and brand.

*"By deploying Telestream iQ solutions, we are able to rapidly decrease the meantime to repair of our Horizon and Horizon Go video platforms. This is done by monitoring both the quality of experience and quality of service, providing distinct insights into the real root causes."*

Florian Münz, Senior Manager, Service Deployment & In Life Entertainment Technology at Unitymedia.

## OTT Streaming Involves A Multi-Vendor Ecosystem

OTT providers are encountering the challenge in assuring a high-quality viewing experience in a multivendor ecosystem streaming video presents. Within this ecosystem you have the content owners, Online Video Service Providers (OVSP) preparing the content, Content Delivery Networks (CDN) that are the transparent backbone of the Internet in charge of content distribution, the Access Networks Providers that give the devices a connection to the CDN and the applications that provides the playout of the content. All OTT Providers are unique in the sense of the content and what part of the distribution chain they manage, but what is constant is they all use a CDN provider.

If it can be proven that one CDN offers superior service, they can charge a premium – and some content providers are happy to pay for it. Broadcasters regard this guaranteed service as a shrewd investment, but how can they valid it. Active video monitoring and analytics is a cornerstone of their ability to ensure this guarantee. This is how broadcasters and content owners can be more confident that high-value video is reaching their customers.

OVSPs, CDN Providers, and Access Network Providers with video quality assurance system can, also, offer access to the broadcasters and content owners, so they can see what is happening with their content. This kind of transparency has a positive impact on customer loyalty. Not only does video monitoring help the delivery platform provider identify and resolve issues faster, but it strengthens their brand and helps them develop and market high-value services that are focussed on their customers' needs.

Therefore, video monitoring is a critical technology throughout the distribution chain from before the origin server, right up to the final consumer delivery mechanisms. Broadcasters and content owners should validate the quality of what they send to the delivery platforms. Delivery platforms should make sure they're receiving good quality content; ensure they're encoding and packaging it correctly as well as validate what they're sending to the CDN is of pristine quality. CDN providers should be using video monitoring to increase the value of their services.

## A Holistic Approach To Video Monitoring And Analytics

Telestream iQ has been active in the video monitoring and analytics market for over 18 years. One of the key differentiators, we see is the ability to provide a holistic approach to monitoring – from content contribution throughout the distribution network to the end device. The ability to triage events and isolate areas of impact is the first step in to solving problems. Making use of network events and performance trends, OTT providers can even get ahead of problems. Focusing on strategic improvements where investment and energy will yield the greatest return.

On one level, a video quality assurance solution should provide a 'red light / green light' indicator of service health, which enables it to be used as a service provision management tool by non-technical managers. Simultaneously, when required, it can dive deep into a quality issue – even looking at data flows between two specific devices – so that issues are identified and rectified in the most efficient and timely fashion. That's a decreased time to repair, and lowered personnel expenditure to achieve a solution. All by having the right tools for the job.

Over time, Telestream has identified a series of demarcation points where it is most valuable to position monitoring. If the part of the customer workflow that we identify as needing to be monitored has been outsourced, then we must follow it. Monitoring needs to follow the video wherever it goes.

A monitoring platform core value is not so much in the fact that it is virtualized, but rather in the depth and breadth of monitoring data it provides, combined with its intuitive user interface. Through this, content providers and broadcasters can ensure QoS and QoE. They can build businesses, grow strong brands and successfully tap into a highly-lucrative if fiercely competitive global market.

If you would like more information about Telestream video quality assurance platform visit: http://www.telestream.net/iq/overview.htm

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