



Video QoE Case Studies

How Sandvine Video QoE Analysis equips network operators with actionable – and valuable – insights

Information is only valuable if it can be put into productive use. This document presents three real-world case studies from Sandvine's customer base to show how:

- A Tier 1 fixed access operator used Sandvine's network performance insights to quickly identify and resolve a QoE-impacting issue
- A Tier 1 converged access operator introduced unique subscriber perception and network performance data into their existing big data analytics solution
- An incumbent LTE operator diagnosed the reason for variable QoE, allowing them to prioritize network investments to maximize the benefit for subscribers chosen and limited by customers to minimize their data charges on shared family plans

INTRODUCTION

Online video accounts for the majority of downstream internet traffic. Combined, the three main categories of video content – Streaming, Social, and Live – typically account for 60% or more of subscriber data, with the proportion rising during the evening's peak period.

And with High Definition (HD), Full High Definition (FHD), and Ultra High Definition (UHD) video all becoming more common, both the volume and share of video are poised to grow significantly in the short term.

The importance of video quality

Plus, for many internet users, online video is their primary source of entertainment, information, and social connection. Unsurprisingly, video quality of experience (QoE) is extremely important.

In fact, video QoE has arguably become a proxy for the quality of an internet connection or an operator's network as a whole; if a subscriber is watching a video and it starts to suffer from buffer stalls or bitrate downshifts, then these issues are interpreted as symptoms of network performance problems.

Video's ubiquity creates an opportunity for network operators

Video quality is a bit of a double-edged sword for operators. Yes, subscriber expectations are high, which applies constant and significant pressure. However, a high video QoE can also serve as a differentiation mechanism within the market.

Additionally, each and every video that is consumed presents an opportunity to gather crucial information about subscriber experiences and network performance – but only if the right solution is in place.

Analyzing video QoE with Sandvine's Active Network Intelligence

Sandvine's video QoE solution measures key performance indicators (KPIs) for the subscriber experience (e.g., video resolution) and for network performance (e.g., throughput, latency, packet loss). These measures are used to calculate an easy-to-understand video QoE score and to determine the overall streaming health of the network.

The solution also provides insightful metadata associated with each video viewed, including the video service name, the device being used, the location of the viewer, and the source of the video (e.g., CDN, Netflix OCA, BGP Peer).

Importantly, because the solution is built upon Sandvine's industry-leading traffic classification technology, it works for encrypted video and adaptive bitrate (ABR) streaming¹.

¹ For more details about Sandvine's Video QoE solution, please see the Video QoE Analysis solution brief



Sandvine's Active Network Intelligence Portal enabled quick and correct root cause analysis that allowed this Tier 1 fixed access operator to quickly remedy a QoE-impacting issue

EXAMPLE #1

Protecting subscriber experiences by quickly pinpointing a Netflix cache misconfiguration

A Tier 1 fixed access operator received support calls and online feedback from subscribers who were unhappy that Netflix video quality was poor in the evening – during the network's peak hours.

To attempt to solve the problem, the operator installed a Netflix Open Connect Appliance (OCA, also known as a Netflix cache); unfortunately, the quality issues remained, threatening to increase subscriber churn.

The operator realized that to take informed action a more comprehensive understanding was needed. To diagnose the problem more precisely, they examined the Video Analysis utility within Sandvine's Active Network Intelligence (ANI) Portal.

The dashboards within confirmed that subscribers were still experiencing a high rate of buffer stalls despite the introduction of the cache. To learn why this was the case, the operator looked deeper into the KPIs shown in the dashboards. They discovered that during peak hours, while packet loss on the access side was within the normal range, there was an abnormally large number of packet drops on the external link (towards the Netflix cache).

This information suggested that the root cause of the problem was with the Netflix cache; the operations team quickly inspected the cache and confirmed that it had been misconfigured. Upon fixing the error, the video QoE issues disappeared and subscriber complaints disappeared.

Figure 1

The Usage Overview dashboard is the starting point for understanding video streaming activity, quality, and related characteristics including devices and locations





Using Sandvine's integration with Apache Kafka, this Tier 1 converged access operator introduced unique subscriber perception and network performance data into their existing big data analytics solution

EXAMPLE #2

Augmenting a Big Data subscriber quality monitoring solution with Video QoE Metrics

A Tier 1 converged access operator had invested heavily in a centralized big data analytics system. However, to benefit from the full potential of this system – and to help the operator achieve their goal of being the top-ranked network for video quality – the data needed to incorporate meaningful subscriber quality of experience metrics.

To introduce this important information, the operator turned to Sandvine's Video QoE solution for both subscriber perception (e.g., video resolution, streaming health, video QoE score) and network performance (e.g., throughput, latency, packet loss) KPIs.

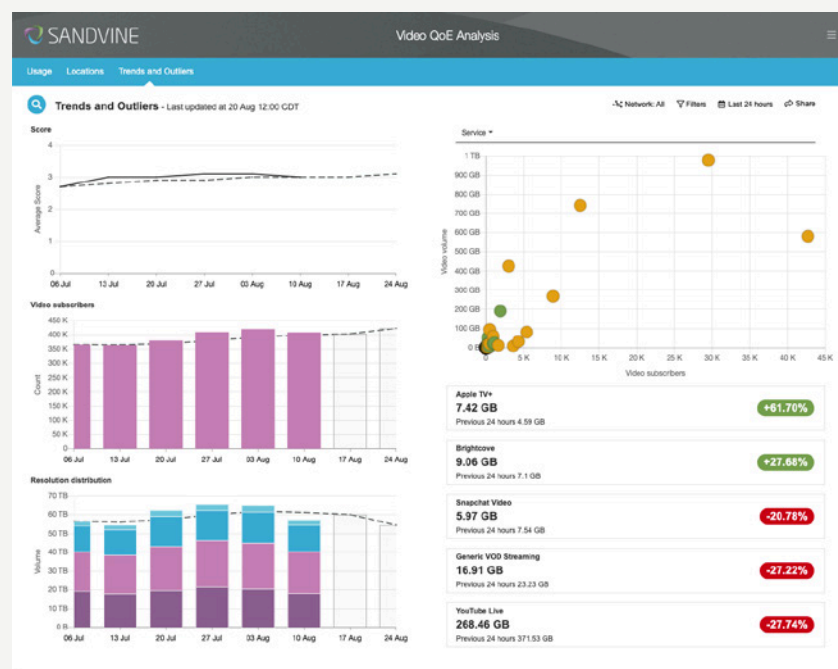
Crucially, Sandvine also provided important characteristics associated with each video stream, including the streaming device, video service name – even for hyper-local services – and user location.

To get the measurements, metrics, and metadata into the existing big data system, the operator used Sandvine's Apache Kafka integration.

The operator's goal for this project was to develop a comprehensive understanding of, and monitoring capability for, the subscriber experience. The project was deemed a strong success in both regards – manual validation confirmed that the video QoE scores provided by Sandvine correlated very highly with scores provided by human testers.

Figure 2

The outliers and trends dashboard allows the user to discover key insights about the video quality in their network and to forecast how video usage and video quality will evolve in the near future.





Equipped with actionable insights from Sandvine, this incumbent LTE operator was able to prioritize network investments to maximize the benefit for subscribers

EXAMPLE #3

Informing prioritized network investments with Location-Based Video QoE Insights

An incumbent LTE carrier was concerned about variations in the quality experienced by subscribers throughout the country's expansive mobile network. In particular, they wanted:

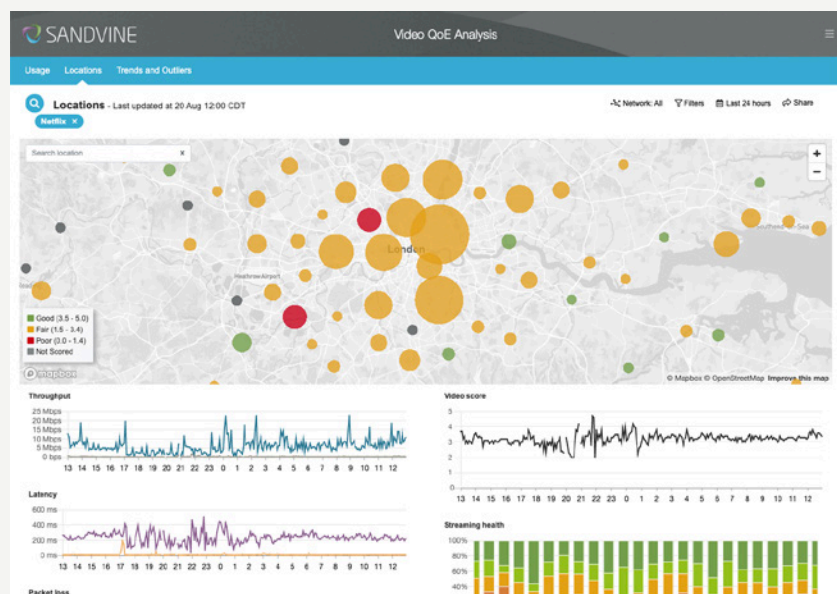
- To understand where subscriber QoE was below target levels
- What factors contributed to these poor experiences

Using the Locations dashboard of the Video Analysis utility within Sandvine's ANI Portal, the operator was able to view video QoE across the entire network. Doing so quickly revealed specific locations with comparatively poor video QoE. KPIs showed that these locations were experiencing poor streaming health, which suggested a high likelihood of QoE-impacting buffer stalls. These locations also delivered primarily lower-resolution content to subscribers as adaptive video downshifted to lower bitrates.

These insights allowed the operator to identify the factors behind the challenging network conditions; in this case, the primary cause was older-generation infrastructure elements reaching capacity due to rapidly growing video traffic – due in part to the popularity of the operator's own streaming service. Equipped with this information, the operator was able to prioritize network upgrades to deliver maximum benefit for subscribers.

Figure 3

The Locations dashboard allows operators to explore how video performance indicators (e.g., throughput, latency, packet loss) and quality metrics (e.g., quality score, streaming health, resolution) vary by subscriber geography



ABOUT SANDVINE

Sandvine helps organizations run world-class networks with Active Network Intelligence, leveraging machine learning analytics and closed-loop automation to identify and adapt to network behavior in real-time. With Sandvine, organizations have the power of a highly automated platform from a single vendor that delivers a deep understanding of their network data to drive faster, better decisions. For more information, visit sandvine.com or follow Sandvine on Twitter at [@Sandvine](https://twitter.com/Sandvine).



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