



Video QoE Analysis

Analyze user perception of video performance based on video-centric QoE metrics



VIDEO QOE ANALYSIS DELIVERS:

Accurate Classification

Sandvine's unique traffic classification and measurement technology delivers rich visibility into QoE and video service usage, regardless of video application encryption status

Actionable Intelligence

Intelligence can be actioned with a network optimization solution to manage video quality based on the root cause of degraded video QoE

Holistic View

Sandvine's ANI Portal displays a comprehensive view of video content usage in the service provider's network, including usage statistics, video quality from both an application and device perspective, delivery performance, and location-specific quality metrics

Augmented QoE Key

Performance Indicators

Standard QoE KPIs – throughput, packet loss, and latency – are augmented with additional KPIs specific to video traffic to determine the true viewing quality experienced by customers

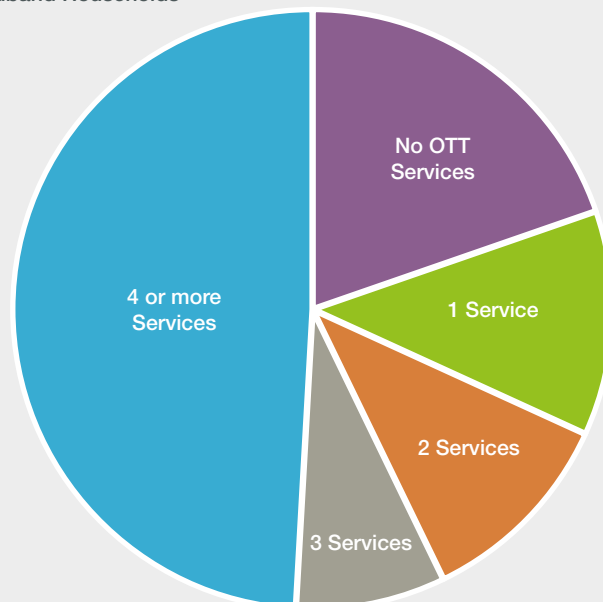
MARKET OVERVIEW

Video accounts for more than 65% of total global internet traffic (according to Sandvine's Global Internet Phenomena Report 2023) and poor video quality is the most visible and common symptom of a service provider's failure to deliver network quality to consumers.

The global proliferation of streaming services (**Figure 1**) has created an intensely competitive market, where video services are competing on differentiators, such as offering 4K video quality (at a premium price point than standard or high definition quality). They are also focused on improving the efficiency of their platform and encouraging consumers to run speed tests to measure the quality of the network delivering the service. However, speed doesn't automatically equate to quality.

Figure 1

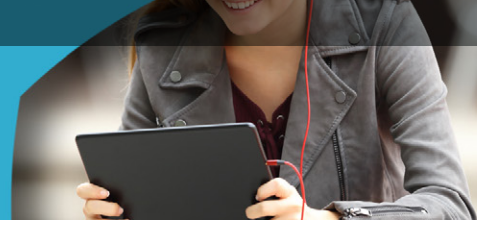
Number of Video OTT Service Subscriptions, US Broadband Households



Source: <https://www.cordcuttersnews.com/study-49-of-us-broadband-households-have-4-or-more-ott-service-subscriptions/>

As binge watching becomes common place, with more and more households around the world cutting the cord in favor of on-demand content, consumers will look to increase their plans to support 4K and HD streaming services. These higher ARPU binge watchers will be sensitive to poor quality when streaming in 4K and HD, as the sheer increase in pixels on larger screens are less forgiving than lower resolutions on smaller screens.

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Consumer adoption and prioritization of video services create significant challenges for service providers:

- **Higher peak bandwidth levels:** Video applications (or video on demand) are consumed in real-time, instantly driving up traffic. The daily demand for video typically peaks from 8PM to 11PM, where the desired streaming quality is HD. Expanding 4K content consumption will drive up usage without significant customer or ARPU growth unless service providers upsell high-value, streaming-optimized plans.
- **Heightened quality sensitivity:** Video is a sensory experience with rapidly changing sights and sounds, so shifts in quality (e.g., stalls, pixelization, compression artifacts, shifts up or down in resolution, changes in frame rate) are instantly recognized by the viewer. These quality failures introduce a risk of churn and, if persistent, significantly impact network quality perception.

Aside from the dynamic nature and challenges associated with video, existing analytics solutions often lack comprehensive end-user experience visibility by relying exclusively on sampling and are ineffective when it comes to encrypted video. With the right solution in place (**Table 1**), every single video playback is a chance to measure and monitor the end-user experience on the network.

Table 1:
Video Analytics Solution Requirements

Measure True QoE	To support a service provider's customer experience management initiatives, video QoE solutions must measure the video experience quality from the perspective of the end user.
Classify and Measure Encrypted Video	To be effective, video QoE solutions must be able to accurately classify, and measure encrypted video. Meaning, legacy solutions that rely on video header fields (e.g., container type, codec, resolution, etc.) are already inadequate and have a very limited remaining operational life. Heuristics is required to not only recognize encrypted video traffic, but also to determine the resolution dynamically to detect overall video streaming health.
Support Adaptive Bitrate Streaming	To measure all contributing QoE factors, the video QoE solution needs to go beyond application identification and be able to determine the streaming technique, as the majority of video streaming consists of adaptive bitrate streaming, which is more challenging to accurately measure QoE.
Concurrent Video Streams	Solution must be able to fulfill the above in an environment where content associated with any individual stream can be split across multiple flows, and an individual household (or mobile hotspot, or other analogous point) can have multiple concurrent video streams in play.

As service providers continue to make the transition to service-focused monitoring, it's critical to have a contextual view of video quality of experience (QoE), including applications, locations, service plans, device types, and other key subscriber attributes. This contextual awareness can contribute to determining video QoE from the viewer's perspective and determine root cause of the problems. However, to truly measure video QoE, a solution must be able to detect and measure user actions and the behavioral characteristics of the video itself.

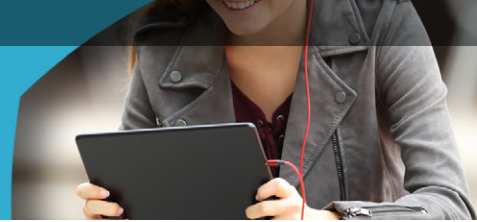
As video continues to be consumed at a bingeable level by most consumers, service providers need to take the first step to manage this bandwidth-intensive application by understanding the types, usage level, trends, and congested locations – all of which impact the experience delivered to the subscriber.

USE CASE OVERVIEW

Sandvine's Video QoE Analysis enables service providers to measure the key video QoE metrics and KPIs for the video applications and services that are driving the purchase of higher value service plans in their network. The average streamer has higher expectations for quality, and this use case allows service providers to closely monitor, report, and analyze encrypted and unencrypted video quality metrics to understand performance trends.

Video QoE Analysis helps service providers to understand video QoE by combining Sandvine's traditional KPIs (e.g., throughput, packet loss, and latency) with video-specific

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quality indicators – in spite of wide-spread encrypted video services. Specifically, Sandvine tackles encryption by leveraging ANI machine learning capabilities, which further augment the traditional QoE KPIs to achieve a true and holistic view of end-user video experience.

Sandvine’s video QoE KPIs are measured, and scores are calculated per subscriber, per application, per location, and per device. This provides the service provider a comprehensive quality picture, which is necessary for conducting root cause analysis within customer care and planning teams.

SANDVINE’S VIDEO QoE KPIs

- **Throughput:** Also known as bitrate – calculated every 250 milliseconds (captures spikes and sudden bursts needed to download chunks of video) and aggregated over five minutes
- **Latency:** User side – calculated every five seconds and aggregated over five minutes
- **Packet Loss:** User side – calculated every five seconds and aggregated over five minutes
- **Video Resolution:** Possible values are SD, HD, FHD, and UHD
- **Streaming Health:** Indication of video stalls (measured on a scale of one to five, with one indicating high stalls/longer stall occurrences and five indicating no stall occurrences)
- **Startup Health:** Qualifies streaming health experienced at the beginning of video streaming or playback

The use case not only uses key metrics to calculate video score, but it also exposes the KPIs individually to provide a more comprehensive picture of the quality, in order for the service provider to conduct proper root cause analysis within their customer care and planning systems.

This use case provides three key views in Sandvine’s ANI Portal, which aid in understanding how video is performing and where potential action should be taken. The data displayed provides a timeframe of 24 hours or 7 days. These views include:

Usage

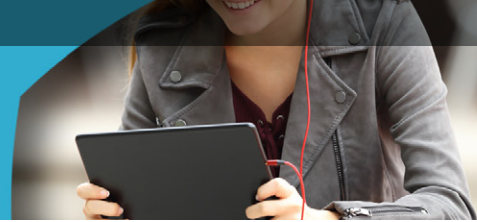
This view (**Figure 2**) gives an overview on video traffic, reporting on subscriber count and volume, broken out by resolution, video service, location, and device with a view into peak time consumption.

Figure 2

Video QoE Analysis – Usage



Video QoE Analysis

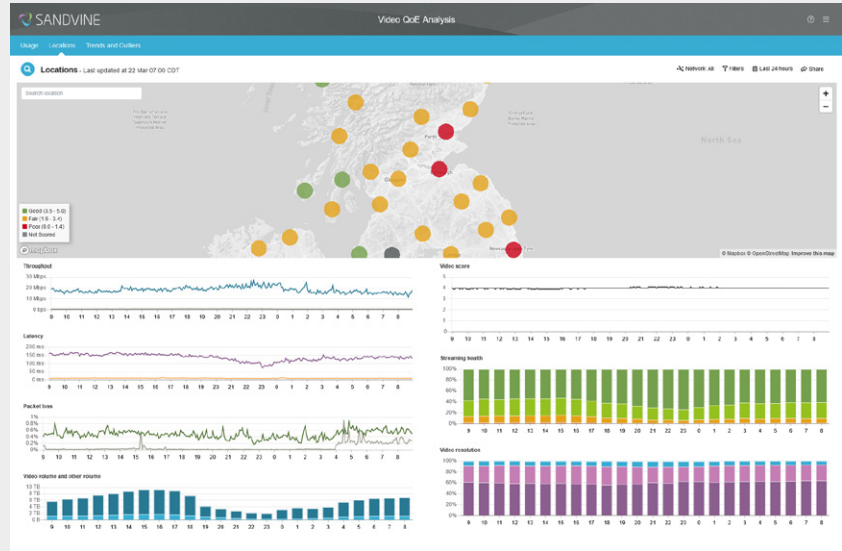


Locations

This map visualization (**Figure 3**) gives service providers the ability to navigate the network and see video QoE score by location(s), which can then be selected to display collected video metrics over time.

Figure 3

Video QoE Analysis – Locations

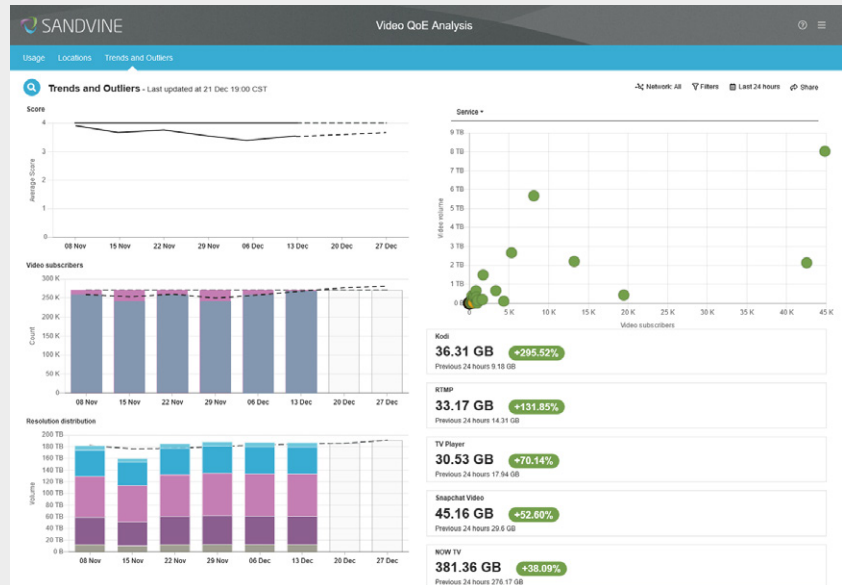


Trends and Outliers

The trends and outliers page (**Figure 4**) gives insight into the trajectory of video traffic and subscribers. The plot will call out outlying services or locations, with a disproportionate number of subscribers versus video volume.

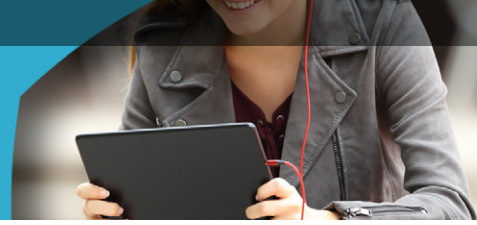
Figure 4

Video QoE Analysis – Trends and Outliers



Video QoE Analysis allows service providers to know whether their high ARPU subscribers are being served good quality video services and how video is impacting their network. It also provides the contextual awareness to directly address issues, which is the first step to video management.

Video QoE Analysis



ABOUT SANDVINE

Sandvine's cloud-based Application and Network Intelligence portfolio helps customers deliver high quality, optimized experiences to consumers and enterprises. Customers use our solutions to analyze, optimize, and monetize application experiences using contextual machine learning-based insights and real-time actions. Market-leading classification of more than 95% of traffic across mobile and fixed networks by user, application, device, and location creates uniquely rich, real-time data that significantly enhances interactions between users and applications and drives revenues. For more information visit <http://www.sandvine.com> or follow Sandvine on Twitter @Sandvine.



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