

App QoE
Use Cases
for Fixed, Cable, Mobile, and
Satellite Network Operators

 **SANDVINE**

The App QoE Company

Analyze

Sandvine's **Analyze** Use Cases encompass all that you do when it comes to saving or making money on your network serving as the foundation for all Optimize and Monetize Use Cases. Our Analyze solutions are built off of the industry's **most accurate application data** and machine learning-powered **application classification** of more than 95% of Internet traffic – per subscriber, per service – across 2500+ applications and a growing library of 5000+ signatures. We actively test more than 122 applications daily, and update classification logic every week.

Sandvine's Analyze Use Cases combine so you can tackle:

Capacity Planning

Data-driven decisions for right-time coverage, capacity and quality.

Operations and Customer Service

Troubleshoot faster with automated network diagnostics and network performance monitoring that will help you improve customer satisfaction, reduce churn, and reduce OPEX.

Performance and Optimization

Get ROI on your investments by grasping what's driving congestion and implementing and enforcing fair-usage so that the best App Quality of Experience (QoE) is delivered to the most customers. Also, improve fraud detection and security.

Service Creation

Finding new ways to monetize or create new revenue streams based on the insights that only an application-centric view can provide. Protecting your subscribers from any fraud while proactively identifying misuse in your network.

Optimize

Sandvine's **Optimize** Use Cases are all about bringing your investment power back into your pockets. This is based on an inline solution that provides a new approach to network optimization while maintain your customer's QoE and staying compliant to regulatory standards. Leveraging the industry's best classification and most granular App QoE scoring your ability to control what is on your network during times of congestion will allow you to save months if not years of CAPEX investments in the way of CAPEX deferrals, capacity management, and OPEX savings.

Sandvine's Optimize Use Cases combine so you can tackle:

Manage Heavy Users

Sandvine's App-QoE-centric solutions can help solve heavy usage issues. These users are carefully managed so their impact on the network and on other users is controlled, reasonable, and fair.

Ensure Fair Usage

Sandvine's App QoE centric solutions take the customer's point of view. As a result this offers the industry's most precise congestion management solution, and enables network operators to balance the traffic and distribute network capacity fairly between users to ensure maximum delivered QoE.

Tame Network Congestion

With Sandvine's App QoE-driven use cases, operators can achieve balance between two competing factors – reduced CAPEX/OPEX and good QoE – for the major cause of congestion: volume.

Ensure Optimal Video Delivery

Sandvine App QoE-centric enforcement intelligently rates limits on a per-stream basis, ensuring fairness and reducing the average bitrate per stream without compromising quality. More advanced approaches are possible as well, incorporating real-time congestion awareness, service plans, device types, and other factors for extremely precise optimization.

Monetize

Sandvine's Monetize Use Cases are all about creating new revenue streams, preventing fraud and strengthening your connection with your customers. This is based on an inline solution that provides a new approach to network billing, revenue protection, and personalization while ensuring that your customer's best interest is your top priority with premium quality of experience, and revenue assurance.

Leveraging the industry's best classification and most granular App QoE scoring your ability to truly understand your customer has never been this accurate or telling. This in turn will allow you to set controls in place, to secure how you charge your customers, protect your network from unwanted traffic, keeping your subscribers safe, and creating new services to align with their behaviors and preferences.

Sandvine's Monetize Use Cases combine so you can:

Accurately Charge for Usage

Launch plans with limitless service creativity, improve ARPU, and offer more value to users by deploying Usage-Based Services. With Sandvine's Quota Manager, operators can add advanced options to create further differentiated service offerings, with the industry's lowest TCO.

Enable Parental Controls

Sandvine's Parental Control is a highly personalized, differentiated network-based Use Case that can generate revenue and deliver "good citizen" branding for operators. As a network-based approach, it goes beyond basic URL filtering; it also delivers application and time-of-day control for a more effective offering.

Prevent Video and Bypass Fraud

Sandvine's leading traffic classification technology – backed by domain experts conducting active research – provides network operators with the insight needed to make informed strategic decisions relating to video, television, and voice fraud.

Manage and Charge for IOT Traffic

Operators that use Sandvine's Zero-Rating and Application-Based Plans use case benefit from highly differentiated service offerings that improve ARPU, enhance brand loyalty and Net Promoter Score advocacy, and deliver a personalized customer experience. With Sandvine, operators can quickly capitalize on popular services and internet phenomena by creating and launching with in-demand applications before the competition.

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Analyze Use Cases

Take the guesswork out of network and service management with QoE-centric application and network intelligence.

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Optimize Use Cases

Run a more efficient network with inline intelligence-based traffic management that extends infrastructure lifetime, complies with regulations, and delivers high application QoE.

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Monetize Use Cases:

Grow revenue by rapidly deploying innovative services and protecting against fraudulent activity with Sandvine's usage and application-based charging capabilities.

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5G Adoption Analysis

Track 5G uptake for seamless transition to 5G networks



BENEFITS

- Differentiate and compare 5G-connected subscribers with subscribers connected via other access technologies like 4G
- Get a view into different stages of 5G transition to help facilitate the journey
- Ensure 4G/5G-NSA/5G-SA service continuity

BACKGROUND

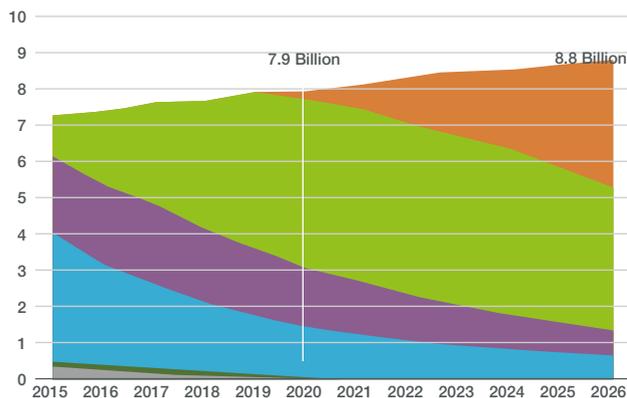
Transitioning to a 5G standalone network, whether FWA or mobile, is a complex and expensive undertaking, one that needs to be handled with clarity to prevent poor customer experiences and recoup costs.

The complexity is largely driven by the multiple phases it takes to make the transition from 4G to a single core 5G network and the need to concurrently support previous and current technology generations.

From the perspective of profitability, the focus needs to be on meeting consumers' high expectations related to the performance and reliability of 5G networks to be able to monetize it. Performance can be largely compromised when investment is not made in a timely or impactful manner i.e., not building out heavily populated locations fast enough.

For operators to make sound decisions on how and when to take steps in their 5G journey, they need to be answer key questions, such as 5G-capable device adoption and subscriber penetration.

Mobile Subscriptions by Technology



3.5bn
Forecast 5G subscriptions

- 5G
- LTE (4G)
- WCDMA/HSPA (3G)
- GSM/EDGE-only (2G)
- TD-SCDMA (3G)
- CDMA-only (2G/3G)

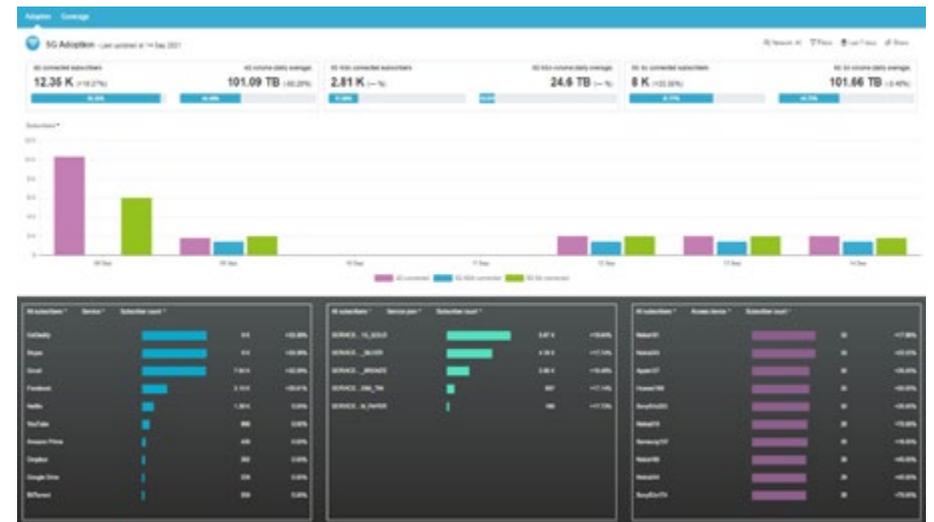
Note: IoT connections are not included in this graph. Fixed wireless access (FWA) connections are included.

SOLUTION

Sandvine's 5G Adoption Analysis use case provides a quick but comprehensive snapshot and scorecard on the progress of 5G NSA and SA investments by looking at the overall network and each radio access type connecting to the core network. It offers a single dashboard to track the transition from older access technologies to the newer ones as they happen. It also gives insight into how well applications are performing based on QoE scoring, which is a good indicator on how customers are perceiving the network.

IMPACT AND RESULTS

5G Adoption Analysis takes away the guesswork for operators as they progress through the various stages in the 5G journey. They are armed with insights from Sandvine's intelligence to invest, build, and operate profitable and valuable 5G networks.



 [Click here](#)

to learn more about our **5G Adoption Analysis** use case

Performance Monitoring and Analysis

Troubleshoot network issues based on application QoE and understand long-term trends



BACKGROUND

Applications dominate network traffic as the reliance on them from consumers, businesses, and an ever-growing list of internet-capable devices continues to rise. Given the prominent role applications play and their increasing complexity, understanding how well they are performing and, more importantly, how end users are experiencing them is paramount.

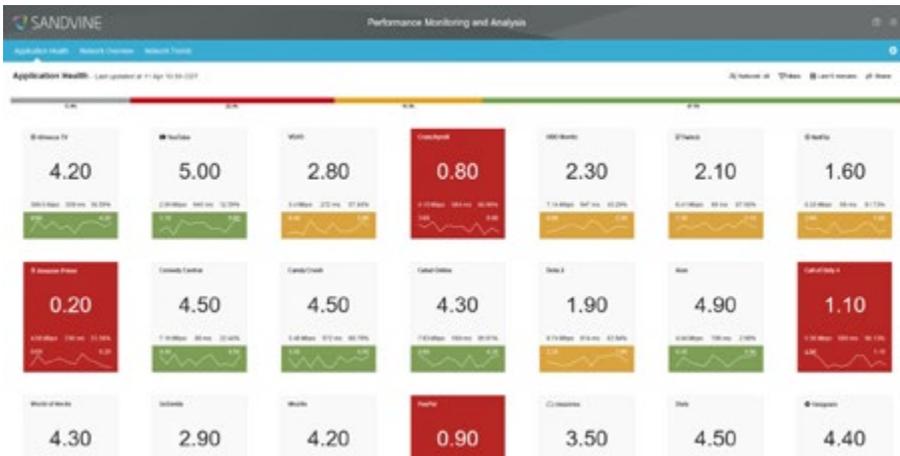
For operators, keeping today's networks in line with performance expectations requires rich, deep, broad, and timely insights to troubleshoot problems, prioritize operational activities, and determine the appropriate actions to rectify quality issues. With the right performance and operational metrics, operators are empowered to make quick and accurate decisions that can save the day; lacking these metrics, operators must play a high-stakes guessing game with everything on the line.



BENEFITS

- Faster time to resolution on problems, reducing OPEX
- Optimize CAPEX to solve systematic performance hotspots

Application Health

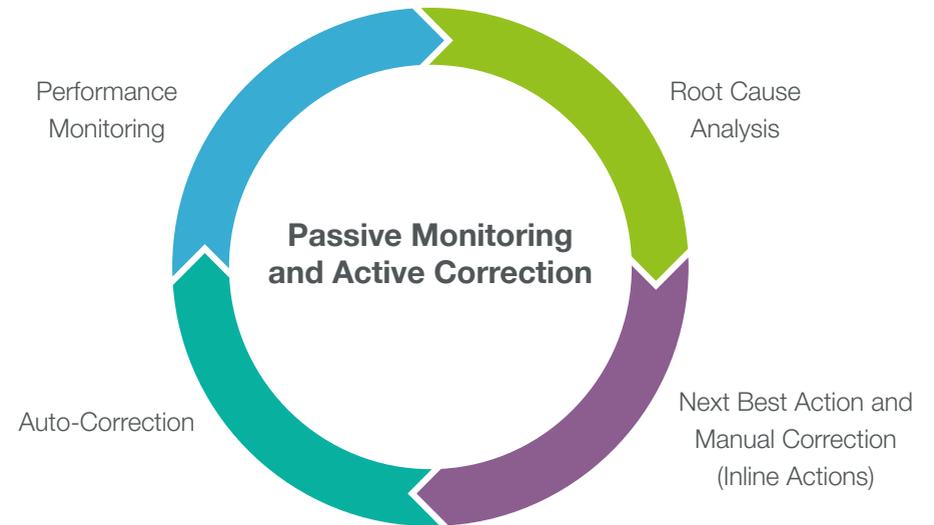


SOLUTION

Sandvine empowers operators with near real-time visibility and a historical view on application quality of experience (App QoE). With tightly integrated views, Performance Monitoring and Analysis is a powerful troubleshooting tool, allowing operators to filter based on different attributes, such as location, device, slice, and subscriber plan.

This use case leverages Sandvine unique scoring technology to determine application QoE, which is based on key metrics (throughput, latency, packet loss, jitter, and other innovative metrics), for individual applications displayed on application tiles.

Performance Monitoring and Analysis plays a key role in delivering automated, 5G service and slice assurance. It monitors performance for NF load, slice health, and application QoE, as part of the closed-loop process.



IMPACT AND RESULTS

Sandvine's App QoE driven insights with PMA improves service provider decision intelligence to quickly diagnose issues, and proactively fix them before they grow into service-impacting problems. Ultimately, end customers are more satisfied and operational efficiency increases.

 [Click here](#)

to learn more about our [Performance Monitoring and Analysis](#) use case

Capacity Planning Analysis

Plan capacity expansion, coverage extension, and CDN investments



BACKGROUND

Capital expenditure burdens on operators remain significant as customer demand for data and data-heavy services constantly increases, and network operators have to plan and expand capacity. But the solution is more than simply rolling out ‘fatter’ pipes; today’s networks are a complex mix of traditional network elements, caches, and content delivery networks, making it difficult (and expensive) for operators to adapt existing infrastructure.

To make informed decisions about capacity planning and network engineering, today’s network operators need more than basic volume projections – they need the deepest possible insight into usage trends.



BENEFITS

- Enhance quality to retain users
- Maximize CAPEX ROI by identifying hotspots and root cause

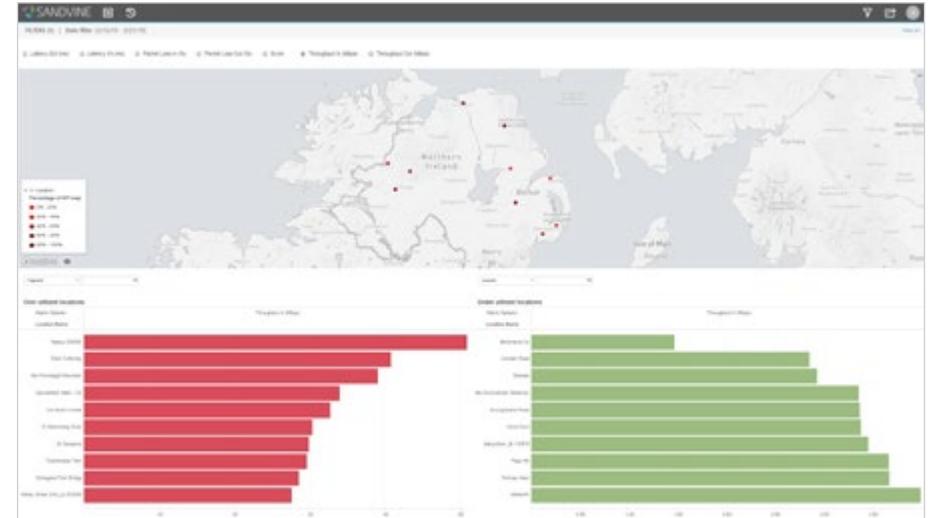
Understand the impact of applications on each individual network asset/location



SOLUTION

Sandvine provides unmatched visibility into network traffic and trends, from comprehensive measurements to advanced QoE metrics, with granular application visibility, user visibility, and network topology/hierarchy awareness. This is driven by its industry leading App QoE-centric solutions that give operators planning insights based on their subscriber’s point of view. This approach is seen as a breath of fresh air as most decision-making revolved around network metrics such as throughput.

By aggregating and analyzing this information – whether in Sandvine’s Analytics interfaces or a big data system – operators can make truly informed network architecture and engineering decisions.



IMPACT AND RESULTS

With the insight provided by Sandvine’s App QoE-based solutions, network operators design and benefit from an optimized network, and know exactly how to spend every unit of capital to deliver a maximum positive impact and ROI.

Capacity Planning Analysis also provides more visibility into how subscribers are using the network, allowing operators to plan their network strategy for both short- and long-term needs.

Sandvine’s Capacity Planning Analysis overview provides a location-based view of network performance to identify performance and quality hotspots that need investigation and/or investment



to learn more about our [Capacity Planning Analysis use case](#)

Subscriber Service Analysis

Rapidly identify sources of subscriber QoE issues



BACKGROUND

There is an unrelenting pressure for operators to deliver the best possible customer experience, including personalized services and improved customer engagement.

Understanding the customer is vital. In order to truly comprehend the customer, a complete picture of user network behavior (e.g., web browsing habits, video interests, application popularity) is needed. Taking it a step further, this insight should be linked to the right performance and operational metrics (e.g., throughput, latency, packet loss, and jitter) to guide customer experience management.



BENEFITS

- Understand a subscriber's application and network experience based on usage and QoE metrics
- Leverage real-time insights for troubleshooting network issues

More importantly, consumer awareness of poor service quality has been magnified by the applications that they use. Long gone are the days when people tolerated occasional outages or service degradations. Even the slightest decline in service quality, whether real or perceived, is enough to trigger a customer to phone the support line or worse yet, churn.

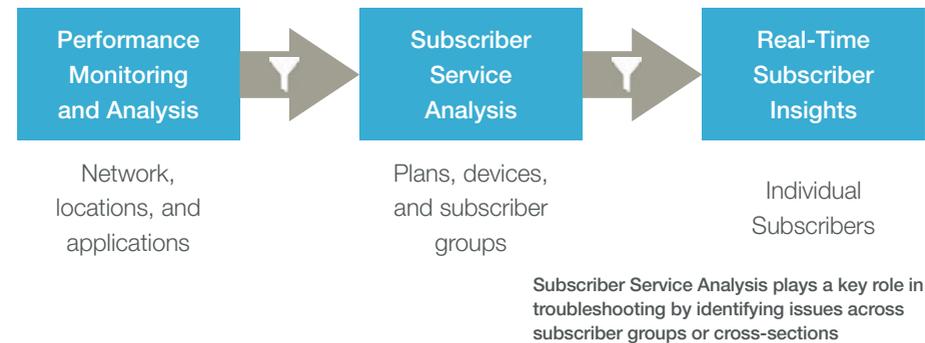
Subscribers are segmented for a better understanding of how they are using the network



SOLUTION

Sandvine's Subscriber Service Analysis gives historical and near real-time customer-centric views to solve key customer experience challenges.

- **Service Planning:** granular user data structured to answer service planning questions, including precise application usage/quality, detailed service trends over time, and usage profiles for each service plan offered to users, further enriched with intelligence like location and network quality
- **Service Quality Trends:** individual users and segmented user groups' historical QoE key performance indicators (KPIs) to uncover service quality trends or outliers that result in customer churn
- **Service Quality Troubleshooting:** an optional, real-time customer experience view via Real-Time Subscriber Insights, designed specifically for customer care teams to identify and resolve quality issues, usage overages, and billing disputes



IMPACT AND RESULTS

This advanced App QoE-based use case option takes a proactive approach to customer care management, improving the visibility and effectiveness for operations, engineering, and customer care teams. It provides real-time and historical insights into a customer's network experience, including quality issues, usage overages, and billing disputes.

Additionally, those operators who opt to leverage the near real-time capabilities have the power to troubleshoot application issues in real-time, directly improving customer satisfaction and mitigating the risk of churn.



to learn more about our **Subscriber Service Analysis** use case

Video QoE Analysis

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



BACKGROUND

After the sheer volume of video traffic, encryption is the second biggest challenge facing operators when it comes to video.

Thanks to encryption, operators are losing visibility on the once informative video metadata, which many solutions relied on to identify video provider, codec, and video type. Unlike other services, which are also plagued by the effects of encryption, video is held in higher regard in the eyes of consumers – one of the most important KPIs. As video quality of experience is closely correlated to churn and overall customer satisfaction, operators need true insight into how all types of video is performing on their network, in spite of the internet going dark.

To truly understand video performance, operators need a solution that accurately detects and analyzes video streams, monitors the network's capacity to deliver an ever-increasing amount of video, and understands end user video quality perception. It is also imperative to have a holistic view of network video trends: the top video applications/services, the content delivery network (CDNs) delivering video content, and end user QoE.



BENEFITS

- Improve CAPEX spend to meet the demand for video and understand subscriber churn
- Increase visibility into video consumption, delivery, and experience for competitive differentiation

Video-first economy for business and entertainment



SOLUTION

Sandvine's App QoE-centric approach has a dedicated scoring mechanism called Video QoE. Sandvine's Video QoE Analysis delivers powerful, actionable video insights, which includes encrypted video traffic.

At a per-flow level, this solution scores video QoE by combining existing KPIs (e.g., throughput, packet loss, latency, and jitter) with video-centric quality indicators: streaming health (likelihood of video stalls), video resolution, video application, and video engagement. This combination of KPIs give operators the perceived performance quality. Additionally, the ANI Portal also gives operators visibility to understand video usage and network locations, and the ability to dive deep to see video trends and outliers.

IMPACT AND RESULTS

Network operators who implement Sandvine's video-centric analytics use case benefit from visibility into: encrypted video QoE, the root causes of poor QoE, CDN/cache efficacy, and the impact poor video QoE has on churn rates.



Usage overview shows video traffic, reporting on subscriber count and volume, broken out by resolution, video service, location, and device



to learn more about our Video QoE Analysis use case

Gaming QoE Analysis

Analyze critical gaming QoE metrics



BACKGROUND

With gaming popularity on the rise, and the **introduction of cloud gaming**, operators are on the one hand faced with a network challenge, and on the other hand an opportunity.

The gaming experience has evolved to become more interactive and immersive, more complex, more social, and more real time. This evolution creates greater pressure for operators to meet their users' rising QoE expectations, and grow revenues as many users are willing to pay more for a lag-free experience.

Gamers, both amateur and professional, are now even more focused on the quality of their network connection and how well it performs.

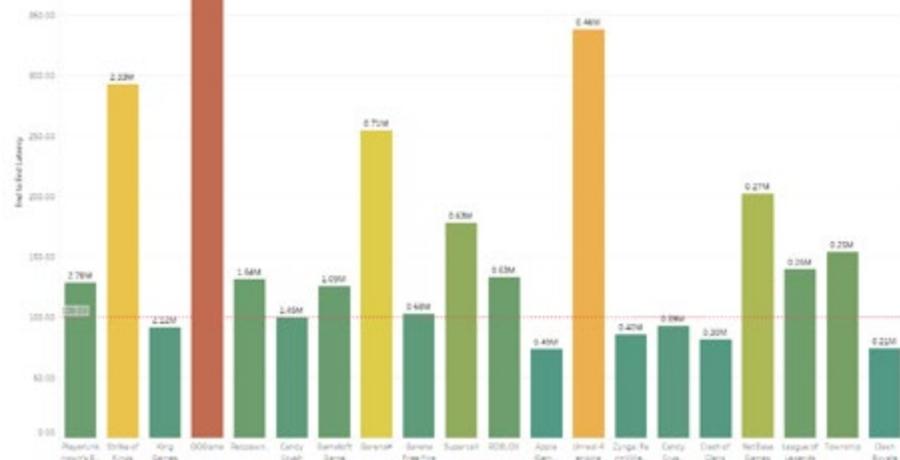
In order to compete and take advantage of the shift occurring in the gaming world, operators need a good understanding of gaming services (e.g., gaming habits and application popularity), how well games are being delivered (linking it with the right network performance and operational metrics), and who is gaming on their network.



BENEFITS

- Offers critical gaming insight into QoE, devices, usage, services, which can be leverage to deliver low-latency experience
- Helps operators identify potential gaming plans

Understand the top gaming applications, usage trends, and the QoE (including latency) being delivered



SOLUTION

Sandvine's App QoE-centric scoring Gaming QoE Analysis empowers operators with the answers to key questions: what games are trending, how well all three major types of gaming (cloud, interactive, and downloadable) are performing, and who on the network can be targeted with compelling and revenue-generating plans.

This use case leverages Sandvine's powerful contextual awareness, App QoE scoring technology, and the largest gaming application identification library in the industry.

IMPACT AND RESULTS

By deploying this unique use case, operators are armed with the necessary insight to combat the negative aspects of gaming and take advantage of this popular service. With a comprehensive view of gaming, operators can identify monetization strategies for their network and leverage QoE and usage insights for optimization.



New network requirements for cloud gaming based on Google Stadia



[Click here](#)

to learn more about our **Gaming QoE Analysis** use case

Home Network Diagnostics

Proactively diagnose in-home WiFi issues



BACKGROUND

As more consumers work and learn from home, the expectations for high quality home network connectivity has drastically increased. These expectations have increased pressure on fixed operators to deliver a good experience to their customers, who depend on their network connection for business, education, and pleasure – with all activities happening simultaneously in many households.

However, from a technical perspective there are many factors that can contribute to reduced network quality, such as poor WiFi placement or upstream/downstream WiFi congestion. It is often hard for operators to pinpoint the root cause since most operators have no visibility into in-home related issues.

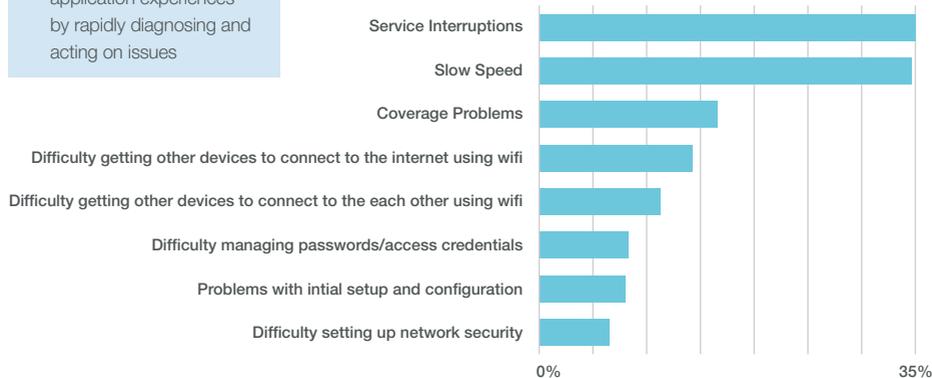
For operators, this lack of visibility and the criticality of good WiFi for consumers in today's environment has proven to be rather costly, whether through the direct cost of deploying unnecessary truck rolls, running inefficient customer call centers, or the indirect cost of customer churn.



BENEFITS

- Optimize truck rolls via machine-learning powered intelligence
- Deliver proactive customer care management
- Reduce call center resolution time and churn, improving OPEX and customer satisfaction
- Improve home network application experiences by rapidly diagnosing and acting on issues

Technical Issues Experienced with WiFi
US Broadband Households Using WiFi at Home



SOLUTION

Sandvine's Home Network Diagnostics delivers the industry's first real App QoE scoring methodology consisting of key network performance characteristics and real-time insights into the root cause of WiFi-related issues, including poor placement and congestion.

This use case can also clearly determine whether or not the QoE problems are an access network issue or a home WiFi issue, as well as provide customer care management an issue history and root cause analysis for any customer.

IMPACT AND RESULTS

By taking a proactive, customer-centric approach and deploying this use case, operators can achieve real-time visibility into customer issues. With this visibility, customer care teams can accurately diagnose the cause, deliver proactive care, reduce call center resolution time, improve customer satisfaction and limit churn. Additionally, this use case also assists in identifying upsell opportunities for in-home network improvement products (e.g., better CPEs, WiFi range extenders, etc.)



[Click here](#)

to learn more about our **Home Network Diagnostics** use case

Cyber Threat Analysis

Identify and quantify threats to users and network infrastructure



BENEFITS

- Delivers advanced categorization of threats, which can be used for management and mitigation plans
- Provides intelligence across different attack phases
- Gives insight into key threat attributes: geolocation-based origin, threat types, potential users and devices involved, number of established and unestablished connections, and volume/bandwidth impact

BACKGROUND

Cyber threats continue to evolve and rise in frequency, making it increasingly challenging for operators to protect the network from malicious and organized cyber criminals. The proliferation of smart devices (including IoT), globalization, and cloudification of business-critical applications create more network entry points to exploit. However, most security solutions used for identifying and quantifying cyber activity lack the necessary network visibility (e.g., URL activity, users and devices involved, originating host geolocation), which is arguably the biggest challenge facing security professionals.

From a visibility perspective, operators need a solution designed to detect threats before they arrive at the boundary between the public internet and a user's network. They also need the ability to track and monitor malicious activities, including origin location, users, and network impact.



SOLUTION

Sandvine's App QoE centric approach allows its Cyber Threat Analysis to be a comprehensive, real-time detection and classification of cyber threats.

The Cyber Threat Analysis use case delivers two key components in building actionable cyber threat intelligence: it collects near real-time information from the network, and provides trends and analytics with crucial insights that enable network operators and security specialists to choose the best approach in defining long term strategies.

Using Sandvine's real-time data and analytics reporting interfaces, security teams can monitor and analyze malicious traffic, and the sources threatening network users and resources, such as botnet traffic, and active connections related to phishing scams and malware infections.

IMPACT AND RESULTS

Operators gain visibility on actions preceding the attacks, what happened in the network during the attack, where the attacks are coming from, and how policy changes were able to mitigate the impact on the attack traffic. This intelligence is critical to detecting the correct mitigation strategy and selecting the most surgical policies.



Click here

to download a PDF of our
[Cyber Threat Analysis and Management Solution Brief](#)

Fair Usage and Congestion Management

Precisely manage congestion, extend infrastructure lifecycle, and protect QoE



BACKGROUND

Congestion has always been a high-priority network issue, and congestion management continues to be very important for operators worldwide. Network congestion leads to frustrated users and, in the long-term, frequent congestion leads to churn. The underlying congestion problem is that all access network resources have a finite capacity, and demand can exceed that capacity, especially during peak times.

Congestion management achieves cost-savings by pulling more utility from the existing network, while preserving service quality. These dual objectives are often contradictory, and a careful balance must be struck. Achieving this balance requires a complete congestion management solution, which has a mechanism to recognize congestion and trigger the appropriate policy that only impacts the exact part of the network or traffic.

With an ever-changing regulatory environment, operators require a flexible solution that adapts and remains compliant with changes in policy.

SOLUTION

Sandvine's App QoE centric solutions take the customer's point of view. As a result this offers the industry's most precise congestion management solution, and enables network operators to balance the traffic and distribute network capacity fairly between users to ensure maximum delivered QoE.

A real-time feedback loop measures the QoE at each location in the network; if resource congestion threatens QoE, then precise management policies take action. The solution is also optimized



BENEFITS

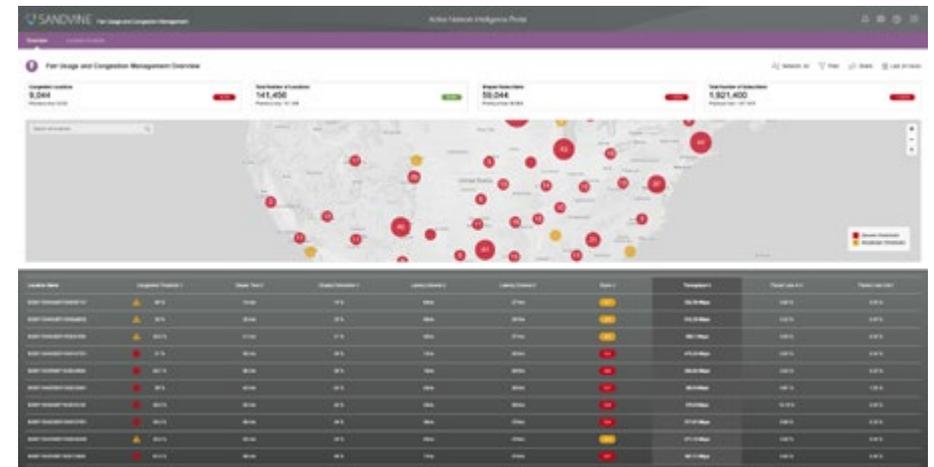
- Reduce CAPEX
- Improve subscriber QoE
- Offer differentiated, tiered service plans

for each type of network access technology, and operates in conjunction with network neutrality traffic management principles. More than that, it can be used for peering and wholesale links, making them more efficient and therefore conserving costs.

IMPACT AND RESULTS

With Sandvine's App QoE-driven Fair Usage and Congestion Management use case, operators can achieve balance between two competing factors – reduced CAPEX/OPEX and good QoE – for the major cause of congestion: volume.

Operators gain critical insight, highly granular data, and contextual awareness to take action in real-time with precision and control, regardless of access network. It also gives them the flexibility needed to adhere to changing regulations, which often call for a very specific set of actions to manage congestion, while maintaining fair access for all users.



The Fair Usage and Congestion Management dashboard visualizes congested areas, including the number of suffering subscribers, and shows the change in bandwidth and QoE after the policy is enabled



Click here

to learn more about our Fair Usage and Congestion Management use case

Video Streaming Management

Manage video bandwidth resolutions and deliver consistent streaming experiences



BENEFITS

- Reduce CAPEX
- Improve QoE for video and other high-priority services, reducing customer support calls and churn
- Gain service differentiation through unique offerings that include self-optimization for users and premium or unlimited video plans

Deliver the best video QoE with the least amount of bandwidth

BACKGROUND

Video streaming continues to account for a large portion of total global internet traffic and shows no signs of slowing down in the coming years, with widely adopted 4K, 8K on the horizon, and the entry of more content providers to the market bringing more content and choice for viewers.

Aside from more content, the continued proliferation of unlimited mobile data plans is also making it even easier for users to consume more bandwidth. These two factors add to the already challenging task of running networks, where cost-savings and QoE compete for equal footing as bandwidth consumption continues to rise.

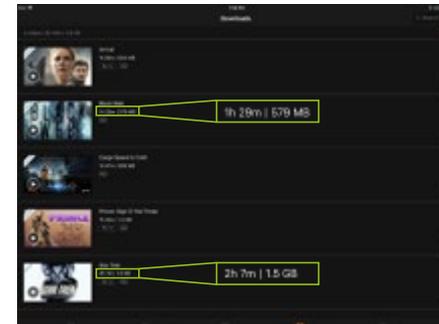
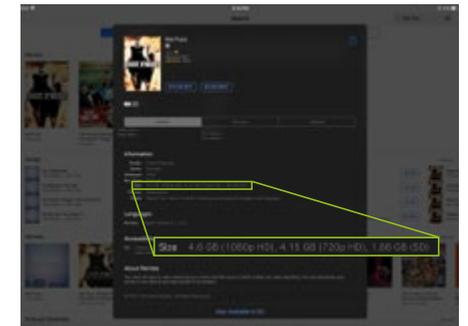
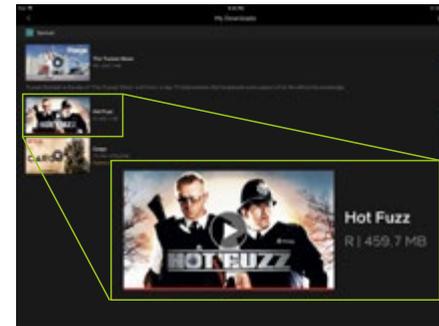
There are opportunities for operators to benefit from video streaming; however, they need a solution not only to accurately identify all streaming services, but also to manage the diverse behavior and bandwidth requirements for optimal QoE for video and other high-priority services, especially during congestion periods.

60% InterNet
TRAFFIC
is video

SOLUTION

Sandvine App QoE-centric enforcement intelligently rates limits on a per-stream basis, ensuring fairness and reducing the average bitrate per stream without compromising quality. More advanced approaches are possible as well, incorporating real-time congestion awareness, service plans, device types, and other factors for extremely precise optimization.

Most of the video shown below is adaptive in nature, with bitrates changing in response to factors including device capabilities and network capacity. The range of bitrates is immense: a 320p video can play smoothly at 850 Kbps, while a 1080p video needs 7.5 Mbps, and a 4K video needs around 15 Mbps.



The top left image shows Netflix with Hot Fuzz at 459MB for a ~2 hour movie. The top right image shows iTunes download options – 4.6GB for 1080, 4.15GB for 720, and 1.86GB for SD. The bottom left image shows a few Amazon Prime videos, which range from 579MB for 1hr 29mins to 1.5GB for 2hr 7min

IMPACT AND RESULTS

By actively managing video streaming traffic, network operators can ensure the consistent delivery of high-quality video, protect other services from disruptive video traffic spikes, and extend the useful life of network infrastructure, thereby, improving ROI and deferring investment.



Click here

to learn more about our Video Streaming Management use case

Heavy User Management

Improve QoE by identifying and managing the network's heaviest users



BENEFITS

- Reduce CAPEX
- Improve subscriber QoE
- Offer differentiated, high-bandwidth service plans

Due to the different behaviors of applications, network capacity is unable to be allocated fairly, causing service degradation

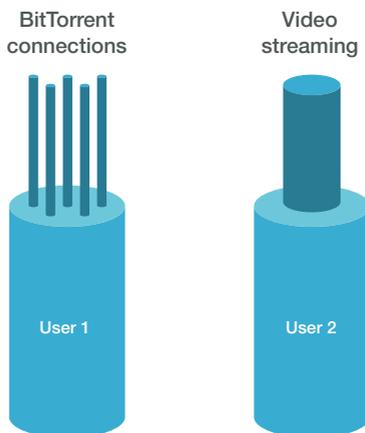
BACKGROUND

While sheer volume and a constant capacity shortage are often the most common cause of congestion, there is also the impact of the network's heaviest users on QoE. The definition of a heavy user varies from network to network, but this typically small segment of users can account for a disproportionate amount of network bandwidth, essentially taking more than their fair share.

For instance, this uneven distribution of network resources can breakdown as follows:

- The top 1% of users account for 15% of monthly bandwidth utilization
- The top 2% of users account for more than 20%
- The top 5% of users account for more than 35%

Regardless of the specific breakdown, the imbalance of bandwidth can create complications and complexity for network planning, service business models, and profitability.



Differences in bandwidth usage caused by application behavior

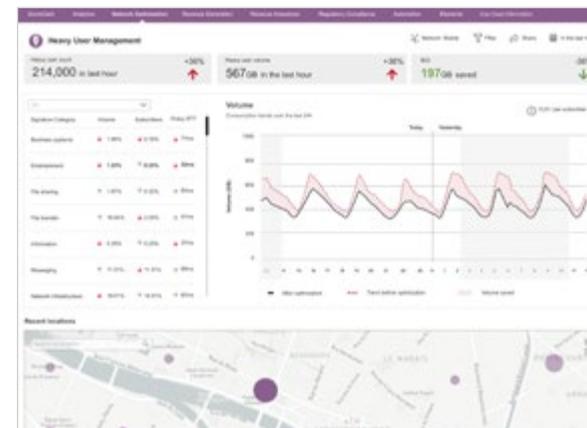
SOLUTION

Sandvine's App-QoE-centric solutions can help solve heavy usage issues. These users are carefully managed so their impact on the network and on other users is controlled, reasonable, and fair.

By measuring usage over a defined period (e.g., by day, by week, by month, by rolling window) and linking management policies to different factors (e.g., time of day, risk of congestion, number of users on a resource), network operators can ensure shared network resources remain available for all users.

IMPACT AND RESULTS

Through the precise management of heavy users, network operators can preserve QoE for the majority of users and increase the carrying capacity of the network overall, enabling operators to serve more customers without the need for additional infrastructure investment. In addition, heavy users can be offered more expensive, high-bandwidth service plans (depending on the regulatory environment), which can drive higher profitability for the operator.



With the Heavy User Management dashboard, operators can drill down by different attributes (for example, by application or by the locations of heavy users) and view the bandwidth savings and QoE improvements from Sandvine's flexible policy management



Click here

to learn more about our Heavy User Management use case

Cyber Threat Management

Identify and manage malicious threats



BENEFITS

- Reduce user infections and user-initiated cyberattacks, improving security
- Minimize bad QoE, which often results in customer care calls and churn

BACKGROUND

Cyber threats continue to evolve and rise in frequency, making it increasingly challenging for operators to protect the network from malicious and organized cyber criminals. The proliferation of smart devices (including IoT), globalization, and cloudification of business-critical applications create more network entry points to exploit.

However, most security solutions used for identifying and quantifying cyber activity lack the necessary network visibility (e.g., URL activity, users and devices involved, originating host geolocation), which is arguably the biggest challenge facing security professionals.

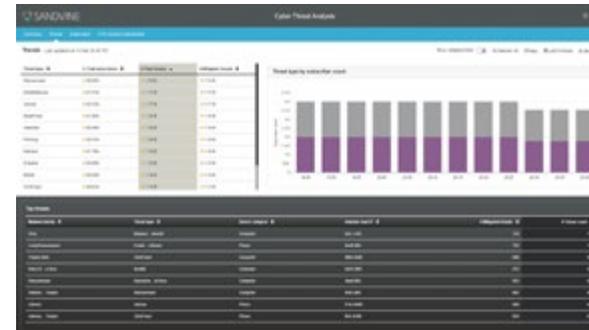
From a visibility perspective, operators need a solution designed to detect threats before they arrive at the boundary between the public internet and a user's network. They also need the ability to track and monitor malicious activities, including origin location, users, and network impact.

SOLUTION

Positioned inline in the network protection domain, Sandvine's App QoE powered Cyber Threat Management adds to the Cyber Threat Analysis use case capabilities the ability to execute real time mitigation policies to block malicious threats, and therefore protect subscribers from a range of network threats and malicious traffic that can compromise equipment and data.

The Cyber Threat Management use case analyzes and solves security challenges on fixed and mobile network environments. Sandvine's Application and Network Intelligence solution identifies and acts on malicious activity, applying network policies in real time to protect subscribers and networks.

Additionally, the use case is integrated with the Sandvine ANI Portal for reporting and visualization via two dashboards:



The **Trends Dashboard** provides visualization of trends of different treat types, as well as users information on the number of mitigated threats.



The **Subscriber Dashboard** provides detailed information on threats impacting individual subscriber with trends over a selectable period of time, and provides details on the mitigated threats for the subscriber.

IMPACT AND RESULTS

By implementing Cyber Threat Management, operators benefit from an integrated, network-based use case that leverages Sandvine's intelligence-based actions. With Sandvine, operators can proactively protect their customers from malicious threats, delivering a better and more secure customer experience.



107 MILLION
MALWARE ATTACKS
against Windows-based Services
JAN-NOV 2021
UP 18% from 2020

Source: cdgportal.com



[Click here](#)

to download a PDF of our
**Cyber Threat Analysis and
Management Solution Brief**

Intent-Based Congestion Management

Manage congestion based on network QoE targets for applications



BENEFITS

- Responsive and precise congestion management based on real network conditions and optimal application QoE parameters
- Self-adjusting, automated solution, requiring minimal manual intervention

BACKGROUND

Network congestion is not a new problem. In fact, the reliance on connectivity has increased for education, entertainment, and business – especially in the home. The importance of resolving congestion in real time has become a key metric for many network operators. At the same time, accurately identifying applications and meeting their quality of experience (QoE) requirements are more complex than ever due to the prevalence of encryption.

Specifically, video and cloud gaming are considered critical from a consumer perspective and are also bandwidth-intensive and congestion-sensitive application types. Combined, they represent more than 50% of the global downstream, based on the Sandvine Global Internet Phenomena Report 2020, and therefore need to be closely monitored and managed for QoE and overall bandwidth allocation.

Fixed operators have built their business model around oversubscription of network links, employing congestion management techniques to delay upgrades and investments, while simultaneously maintaining probability and business growth. However, many existing congestion solutions only provide static policies, requiring manual fine tuning to get the parameters correct for the specific network conditions – which change on a minute-by-minute basis. Static allocation of bandwidth resources isn't an effective approach to deal with the dynamic nature of traffic demands and the applications, and can in fact unnecessarily degrade the QoE of a network, causing more problems than it solves.

Network operators need a solution that is dynamic in nature and reduces the burden on manual intervention to adjust to rapidly evolving network conditions.

SOLUTION

Sandvine's App QoE enhanced closed-loop automation use case arms fixed operators with an intelligent approach to managing network congestion based on intended application performance. Intent-Based Congestion Management sets a minimum and target QoE for each application or service category, preventing poor performance while also ensuring better allocation of bandwidth during congestion. It relies on constant network monitoring to detect network congestion and leverages dynamic shaping to deliver a self-adjusting, automated solution.

Data/Monitoring:

Subscriber, application type, throughput, latency, and packet loss

Analysis:

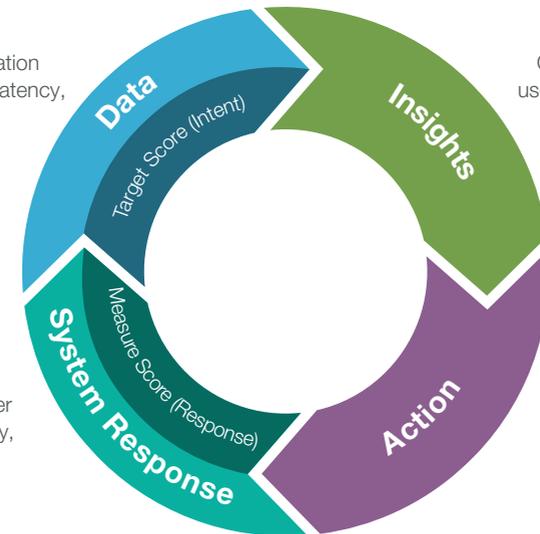
Congestion levels and userQoE per application

Verification:

Measure subscriber throughput, latency, and packet loss

Decision and Enforcement:

Shape, prioritize traffic flows



IMPACT AND RESULTS

By taking advantage of automation to help manage congestion, fixed operators can benefit from precise management, better QoE, improved infrastructure lifetime, and reduced churn. By delaying upgrades, profitability can be increased and better economies of scale can be delivered to both consumer and commercial networks.



Click here

to download a PDF of our
Intent-Based Congestion
Management Solution Brief

TCP Optimization

Improve QoE by managing TCP-caused latency



BENEFITS

- Defer CAPEX by better utilizing existing resources
- Improve subscriber QoE
- Provide closed-loop optimization that adjusts to new network conditions

BACKGROUND

TCP is the internet transport protocol standard, accounting for an estimated 75 percent of all fixed and mobile internet traffic. Considering that TCP/IP was developed in the 1970s, and adopted in 1983, it has been a continuously remarkable enabler of internet growth. However, TCP has also created network performance challenges that have only been magnified as networks and services have become increasingly diverse.

Although TCP is highly reliable as a delivery mechanism, it is chronically inefficient as it cannot recognize and adapt to differences between networks, applications, endpoints, and conditions; this means today's largely TCP-reliant networks will not perform to the full extent of their potential unless a new approach is taken.

Increased transfer rates over an LTE network

Transfer Size	10KB-50KB	50KB-100KB	100KB-500KB	500KB-1MB	1MB-5MB	5MB-10MB	>10MB
Uploads	+18%	+12%	+32%	+36%	+38%	+38%	+31%
Downloads	+11%	+17%	+24%	+43%	+43%	+33%	+24%

This table shows average increases in transfer rates achieved with Sandvine's TCP Optimization solution, all over a working operator's LTE network. Transfer rates are shown by size of transfer because different flow sizes have different characteristics (e.g., web surfing would typically be 50 to 500KB and streaming applications could be 1MB and above)

SOLUTION

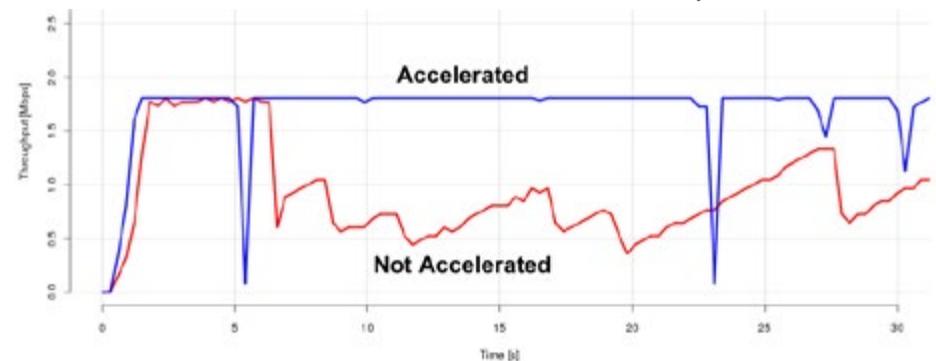
Sandvine's App-QoE based TCP Optimization exerts greater control over TCP, accelerating performance even in networks that have already deployed congestion, video streaming, or network link management solutions. Focusing solely on the transport layer, the solution demonstrates marked improvements in performance.

Sandvine's approach makes TCP access-aware, optimizing it to address the unique characteristics of today's diverse access network landscape, including satellite, 3G, 4G, 5G, fiber, DOCSIS, and DSL. Importantly, Sandvine avoids the pitfalls of proxy-based optimization by employing the more robust and precise TCP "midpoint" approach, asserting control over TCP while remaining transparent end-to-end, to both the end-user device and the server.

IMPACT AND RESULTS

When the TCP Optimization solution is deployed, important network and radio access resources are freed up much faster, and networks and spectrum are far better utilized, supporting more concurrent users, delivering more throughput, and achieving overall greater efficiency. As a result, users are also positively impacted as they experience higher speeds and therefore better QoE.

With acceleration: radio glitches don't cause slow-downs, so transfers complete much faster and RAN resources are more readily available



Click here

to download a PDF of our TCP Optimization Solution Brief

Usage-Based Services

Increase revenue by launching innovative service plans based on perceived value and user behavior



BACKGROUND

Profitability in 5G and beyond, with severe network expansions, is a challenge for operators. Moving away from truly unlimited* service plans, operators are looking to differentiate themselves in the market with innovative and personalized plans.

Users only want to pay for data they actually use and want the cost-certainty associated with volume-based plans. There is no “one plan fits all” to accommodate all users, so the ability to personalize plans and offer compelling service offerings with flexibility is the winning strategy.

With IoT becoming commonplace, operators need to be able to offer plans with smaller data volume with guaranteed delivery times of the data across the network, ensuring high availability and the ultra-low latency required for good QoE.



BENEFITS

- Increase ARPU with innovative service offerings
- Tier services to ensure cost-sensitive users can afford a plan

SOLUTION

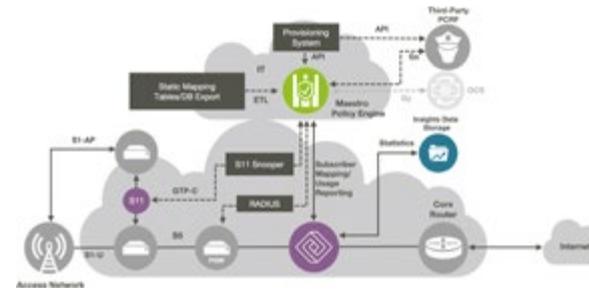
When deployed with Sandvine's App QoE driven platform and Quota Manager, a number of advanced options can be monetized to bring more value to users, increase ARPU for operators, and even improve network efficiency.

- **Speed Tiers:** By implementing plans with differentiated speeds, operators can offer unlimited bandwidth for part of the billing period or the whole quota allowance, even on unlimited plans.
- **Speed Pass:** In combination with speed tiers, operators can improve ARPU by offering users a speed pass, which is an add-on that improves their current plan speeds.
- **Data Rollover:** Operators can build loyalty with users by letting them transfer unused data from one billing cycle to the next or beyond.

*Most unlimited plans are actually limited, containing soft caps and/or speed tiers.

- **Data Pass:** Operators can offer limited, time-based access to data services that do not require a long-term subscription.
- **Time-of-Day and Calendar Promotions:** At certain times of the day or days of the month, operators can offer lower priced data (GB) or zero-rated application usage to give customers more value and utilize existing network capacity.
- **Bolt-Ons:** The solution allows operators to offer highly personalized bolt-ons, like application-based plans or roaming passes, to increase ARPU and offer more complex services.
- **Roaming Plans:** With compelling roaming offerings, operators can target travelers and businesses with valuable plans to increase ARPU.

Usage-Based Services is delivered via a standards-compliant solution that achieves real-time policy and charging with contextual awareness.



IMPACT AND RESULTS

By leveraging Sandvine's App QoE technology and applying Usage-Based Services as the foundation, operators can launch plans with limitless service creativity, improving ARPU, and offering more value to users. By deploying Usage-Based Services with Sandvine's Quota Manager, operators can add advanced options to create further differentiated service offerings, with the industry's lowest TCO.



[Click here](#)

to learn more about our **Usage-Based Services** use case

Zero-Rating and Application-Based Plans

Increase revenue by offering plans with unlimited application and service usage



BACKGROUND

Zero-rating has proven to be a significant competitive differentiator for network operators — multiple operators around the world have combined the technical and business cases for zero-rating to deliver a powerful ROI. Zero-rating can create competitive differentiation, increase customer satisfaction and retention, and create new revenue streams.

Application-based plans have a similar appeal to network operators. Offering plans based on in-demand applications that have a prioritized quality of service (QoS) or larger quotas can create value and increase revenue for the operator. The key distinction between zero-rating and application-based plans is that application-based plans allow operators to offer specific applications versus entire service categories, which is critical when operating in highly regulated markets. By leveraging the extremely popular internet phenomenas like video, gaming, and social sharing, operators can stand out in the market and offer more value for end users.



BENEFITS

- Gain users by leveraging popular content providers
- Upsell to higher ARPU plans that enable zero-rating or application-based quotas

Top 10 Social Sharing Applications Globally

	↑19.8% ↓3.0%		↑8.3% ↓18.1%
	↑15.9% ↓24.2%		↑7.1% ↓1.0%
	↑9.4% ↓1.8%		↑3.3% ↓17.5%
	↑9.4% ↓0.4%		↑3.3% ↓0.5%
	↑8.7% ↓3.1%		↑3.0% ↓3.8%

SOLUTION

With industry-leading application identification, classification, and App QoE scoring, Sandvine provides an accuracy and granularity that is unmatched due to advanced machine learning of encrypted traffic. Zero-Rating and Application-Based Plans can be deployed regardless of the regulatory environment and net neutrality framework, depending on the approach to categories/ services or specific applications. This use case also includes the opportunity to have third-party data sponsorship.

IMPACT AND RESULTS

Operators that use Sandvine's Zero-Rating and Application-Based Plans use case benefit from highly differentiated service offerings that improve ARPU, enhance brand loyalty and Net Promoter Score advocacy, and deliver a personalized customer experience. With Sandvine, operators can quickly capitalize on popular services and internet phenomenas by creating and launching with in-demand applications before the competition.



Sandvine can help operators plan their zero-rating offers with advanced analytics as well as enforce them

With contextual awareness, operators can be more successful with their service launches by:

- Selecting high demand and low-bandwidth applications for zero-rating
- Carefully planning with respect to time, utilization, and shaping policies to manage high-bandwidth application abuse
- Continuously monitoring bandwidth and volume usage trends during peak hours, before and after zero-rating
- Setting thresholds with alerts indicating heavy usage for popular applications.



Click here

to learn more about our **Zero-Rating and Application-Based Plans** use case

Video and Television Fraud Management

Discover, monitor, and take action on video and television piracy



BACKGROUND

Video and television piracy is on the rise; set-top boxes and streaming services are easy-to-use and the average consumer feels secure in purchasing them, as the reality that money changing hands creates an air of legitimacy around the piracy ecosystem.

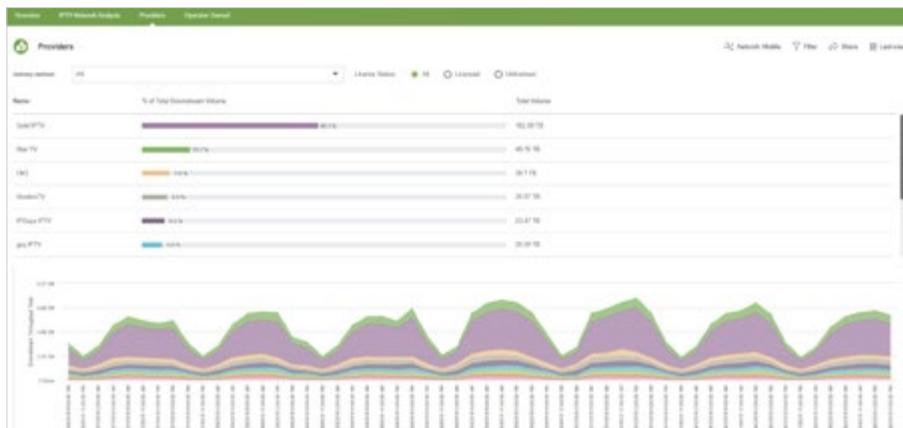
The continued adoption of unlicensed video and TV streaming services could lead to increased cord-cutting, significantly impacting top-line revenue and overall profitability, and, by extension, undermining the very business models that keep networks operating. As a result, network operators who license or produce video content stand to lose enormous amounts of revenue; in North America alone, Sandvine's Global Internet Phenomena Spotlight Report revealed that a significant number of households are accessing subscription television piracy services, with a potential revenue impact of billions per year.

Quickly quantify the number of users engaged in piracy and the amount of pirated content being delivered through the network



BENEFITS

- Identify the revenue impact of piracy
- Mitigate piracy to comply with regulatory guidelines
- Recover customers lost due to piracy with targeted campaigns

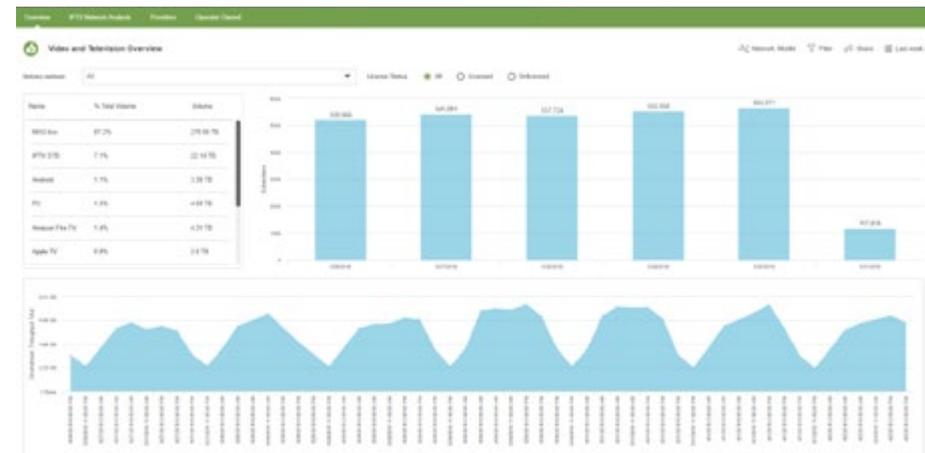


SOLUTION

Sandvine's App QoE approach and leading traffic classification technology – backed by domain experts conducting active research – provides network operators with the insight needed to make informed strategic decisions relating to video and television piracy. Sandvine arms network operators with historical reports and customizable dashboards that both present insights and give operators the opportunity to really explore the data to increase understanding.

Additionally, data can be easily exported to other systems (e.g., big data, fraud management) for further analysis and auditing.

Users	Identify (including in a privacy-sensitive manner) and count users who are consuming pirated video and television content
Usage	Measure how much of your network traffic consists of pirated video and television streaming, and identify trends over time
Device and Software	Learn which hardware devices and software applications your subscribers are using to access pirated video and television content
Services and Hosts	Monitor the video provider services and video hosts behind the pirated content being consumed on your network
Channels	Gain a more complete perspective on how your subscribers are viewing pirated content



IMPACT AND RESULTS

Aided by an accurate understanding, network operators can monitor the threat, support law enforcement and regulatory efforts aimed at preventing the proliferation of these services, incorporate insight into churn prediction models, and help to educate other stakeholders.

Understand the content that is being delivered across the video and television piracy ecosystem and measure the business impact



to learn more about our **Video and Television Fraud Management** use case

Interconnect Bypass Fraud

Protect revenue against fraudulent voice services



BENEFITS

- Identify the revenue impact of interconnect bypass exploits
- Mitigate VoIP fraud and recognize legitimate revenue

BACKGROUND

As the use of VoIP grows due to its wide adoption as part of OTT applications, its integration with the decades-old SS7 interconnect agreements are a growing cause of concern for end subscribers, regulators, and network operators. In emerging markets, it is estimated that anywhere from 10 to 30 percent of mobile voice revenues are lost to gray market voice services. Some users are not even aware that they are using an illegal service, as they purchased minutes from what they thought was a legitimate pre-paid service. The investment for a fraudulent service is small, and the returns can be significant in some parts of the world, specifically where cross-border interconnect is very common.

Measuring the extent of exploitation of security flaws in the voice network enables operators to:

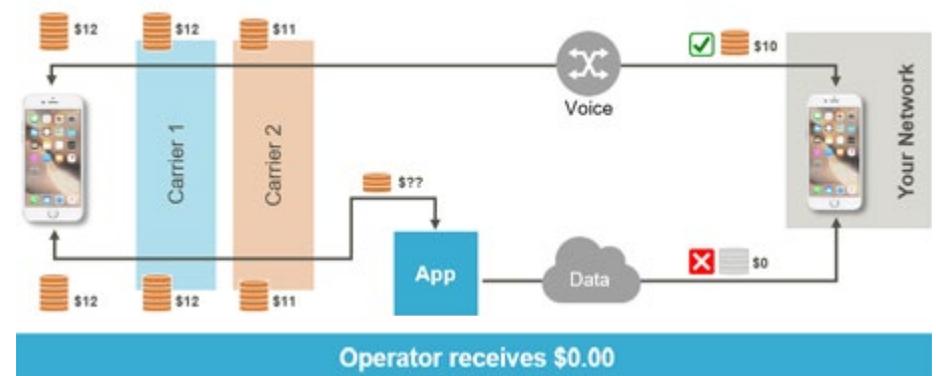
- Make data-driven decisions about where to invest to secure it
- Learn how to report fraudulent activity to regulators
- Identify the risk to the security and privacy of their subscribers
- Help build a mitigation plan to reduce the OTT voice bypass fraud impacts

SOLUTION

Sandvine's App QoE approach which incorporates advanced heuristics, machine learning capabilities, and vast OTT signature library can differentiate between authorized OTT VoIP apps and fraudulent or illegal OTT VoIP app calls. By understanding the varying call types, Sandvine's application and network intelligence is able to break out the composition of OTT VoIP applications and take action separately for legal versus illegal applications. The traffic and calls can be blocked, logged, or can notify the user of the fraudulent application.

IMPACT AND RESULTS

Network operators who implement Sandvine's Interconnect Bypass Fraud can better track VoIP usage on the network and ensure that revenue leakage is minimized. Sandvine's unique ability to correlate the analytics for fraud directly with enforcement is a unique capability that operators can use to prevent their subscribers from receiving fraudulent voice services from illegal operators.



With operators' revenues at risk, it is critical to understand how the money chain for VoIP fraud is impacting the network

 [Click here](#)

to learn more about our **Interconnect Bypass Fraud** use case

ABOUT SANDVINE

Sandvine's cloud-based App QoE 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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