



**Application and
Network Intelligence
Use Cases**



Application and Network Intelligence

Sandvine provides application and network intelligence that helps our customers deliver high-quality, optimized experiences to consumers and enterprises. Customers use our cloud-based solutions to analyze, optimize, and monetize application experiences using contextual machine learning-based insights and real-time actions. Our market-leading classification of more than 95% of traffic across mobile and fixed networks by user, application, device, and location significantly enhances interactions between users and applications.

Our solutions make networks more efficient, enable service differentiation, rationalize disparate data sources, and increase profit margins. With 2.5 billion network users across more than 160 major operators in more than 100 countries benefiting from using Sandvine's Application and Network Intelligence to power the next wave of network transformation, including cloud, encryption, and 5G.

Sandvine Telecom Customers



Mobile (3G/4G/5G)

For mobile operators, there is a distinct need for business transformation to assist in a smooth transition to 5G. With Sandvine's 5G Service Intelligence Engine, and enriched Network Data Analytics Function (NWDAF), mobile operators can maximize revenue, and manage user experience, while controlling costs.



Fixed (DSL, FTTx, FWA)

The impact of COVID-19 has been seen most prominently in fixed networks, where video and gaming applications already dominated, but the work-from-home orders amplified the strain on bandwidth and quality of experience. For fixed operators who choose Sandvine, they can manage the impact of the video-first economy and deliver proactive care that reduces call center volume and costs.



Cable

Competition from video streaming platforms and 5G is fierce for cable operators, who are already hit with the financial impact of fraudulent behavior. To stay competitive, cable operators must take a user-centric approach, delivering the best application experience, while also taking control of the significant increase in upstream traffic.



Satellite

Satellite networks are anticipated to grow in the coming years, driven by the recent emergence of low earth orbit satellites (LEO) and the convergence of 5G networks. However, to facilitate this growth, satellite operators need network intelligence to deliver innovative services, reduce costs, and improve application experiences.

Why Sandvine?

Best Network and Service Data

Classification of over 95% of voice, data and video traffic in real time at 250 ms sample rates, using advanced machine learning techniques.

Contextual Awareness and Insights

Real-time data is correlated with user, device, service and network intelligence to create unique application QoE and network performance scorecards that present a single version of the truth and drive innovation.

Inline Actions

Intelligent, real-time actions to improve performance and deliver personalized consumer, enterprise and IoT services.

Innovative, Pre-Packaged Use Cases

Automation-based use cases drive decisions and actions, deliver operational savings and network efficiencies, and help customers generate new revenues from innovative services.

5G and Cloud-Ready

Offered as cloud native and virtual network functions in public, private, and hybrid cloud environments to meet stringent 5G service level agreements and generate revenues from network slices.

Use Case Index



Solution Area: Analytics

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

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Solution Area: Network Optimization

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



Fair Usage and Congestion Management	30
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Solution Area: Closed-Loop Automation

Analytics-driven automation solves some of the toughest challenges with the right intelligence and without manual intervention.



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Solution Area: Monetization and Assurance

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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Use Case: A software solution to a customer problem

Solution Area: A group of related use cases



Analytics

QoE-centric application and network intelligence

Sandvine accurately identifies, classifies, and analyzes applications in real time.

There is no shortage of data sources for operators to draw from; however, the volume, velocity, and often contradictory nature of the data makes it impossible to understand what is useful and therefore actionable.

As applications continue to evolve – becoming more complex, dynamic and mission critical in nature – operators need to evolve from a network-centric view to one that prioritizes QoE. Furthermore, 5G network slicing will add a whole new level of application complexity in terms of latency, speed, security, and reliability requirements.

Sandvine's Analytics use cases leverage unique traffic classification techniques, such as machine learning, to provide an unmatched visibility into the network and applications. It enables operators to monitor key QoE metrics in real time, identify cyber threats, leverage benchmarking dashboards, use advanced machine learning algorithms to find hidden relationships and trends, and send a targeted stream of data records into a big data lake.

Network operators who choose Sandvine benefit from a range of real-world Analytics use cases:

- **5G Adoption Analysis:** Track 5G uptake for seamless transition to 5G standalone networks
- **Performance Monitoring and Analysis:** Troubleshoot network issues based on application QoE and understand long-term trends
- **Capacity Planning Analysis:** Plan capacity expansion, coverage extension, and CDN investments
- **Subscriber Service Analysis:** Analyze subscribers and services to detect new trends
- **Real-Time Subscriber Insights:** Perform RCA with visibility into real-time customer traffic
- **Video QoE Analysis:** Analyze user perception of video performance based on video-centric QoE metrics
- **Gaming QoE Analysis:** Analyze critical gaming QoE metrics
- **Cyber Threat Analysis:** Identify and quantify threats to users and network infrastructure
- **Home Network Diagnostics:** Proactively diagnose in-home WiFi issues



Network Optimization

Run profitable, high QoE networks

Sandvine arms network operators with the most advanced, flexible, and fine-grained traffic and application management capabilities to deliver high quality end-to-end application and network experiences.

These use cases leverage Sandvine's rich real-time and historical contextual awareness (e.g., application, device, QoE, network topology) along with a set of leading optimization techniques to satisfy consumer and enterprise application and network expectations, including mission critical SLAs, while managing OPEX and CAPEX.

Importantly, Sandvine's Network Optimization use cases conform to worldwide network neutrality guidelines while improving network quality and performance of all network services and applications.

Network Optimization includes the following use cases:

- **Fair Usage and Congestion Management:** Precisely manage congestion, extend infrastructure, and protect QoE
- **Video Streaming Management:** Manage video bandwidth resolutions and deliver consistent, high QoE
- **Heavy User Management:** Improve average QoE by identifying and managing the network's heaviest users
- **TCP Optimization:** Improve QoE by managing TCP-caused latency
- **Cyber Threat Management:** Protect the network and user QoE from cyber threats



Closed-Loop Automation

Leverage automation for predictive insights and QoE-centric optimization

Sandvine clears the way for operators to get the most out of their network investment, whether 5G or fixed, with analytics-driven automation and Sandvine's 5G Service Intelligence Engine – an enriched Network Data Analytics Function (NWDAF).

With the increasing complexity of networks and the dynamic nature of applications, it's imperative for operators to take a more evolved approach, where optimization and prioritization techniques automatically adjust to different network conditions without manual intervention.

For 5G networks, where analytics is built in, an enriched NWDAF can provide a variety of network-related insights, including quality of experience, critical for accelerating the development and operation of new business models and the subsequent use cases.

The following use cases are designed for fixed or 5G networks:

- **Intent-Based Congestion Management:** Manage congestion based on network QoE targets for applications
- **5G Slice Load Analysis:** Network slice analysis for automated assurance
- **5G NF Load Analysis:** Enriched NF load data for proactive user QoE protection
- **5G Observed Service Experience:** QoE-based insights for predictive service experience



Monetization and Assurance

Monetize innovative services and protect against fraud

Sandvine empowers operators to play a bigger role in the 5G value chain, grow revenues faster using intelligence-based inline actions, and mitigate fraudulent behavior.

5G represents a renewed opportunity for operators to capitalize on the reliance on applications for social engagement, business transactions, and infrastructure (e.g., smart homes, smart cities, or smart vehicles). Sandvine's Monetization capabilities enable contextual application and usage-based charging and monitoring for richer, more complex services with a fast time-to-market.

Additionally, Sandvine's highly granular traffic classification can be leveraged to protect against fraud and apply security controls.

- **Usage-Based Services:** Increase revenue by launching innovative service plans based on perceived value and user behavior
- **Zero-Rating and Application-Based Plans:** Increase revenue by offering plans with unlimited application and service usage
- **Parental Control:** Give peace of mind with content and application management for protection of minors
- **Video and Television Fraud Management:** Discover, monitor, and take action on video and television piracy
- **Data Revenue Leakage Monitoring:** Identify misconfigurations and oversights that cause revenue loss
- **Zero-Rated Fraud Management:** Get paid fairly by detecting and mitigating a range of zero-rating fraud techniques
- **Interconnect Bypass Fraud:** Protect revenue against fraudulent voice services



Use Cases

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

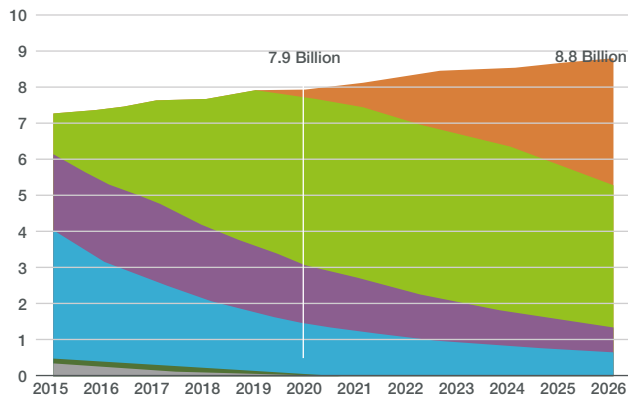
Transitioning to a 5G standalone network, whether FWA or mobile, is a complex and expensive undertaking, one that needs to be handled with clarity to prevent poor customer experiences and recoup costs.

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)

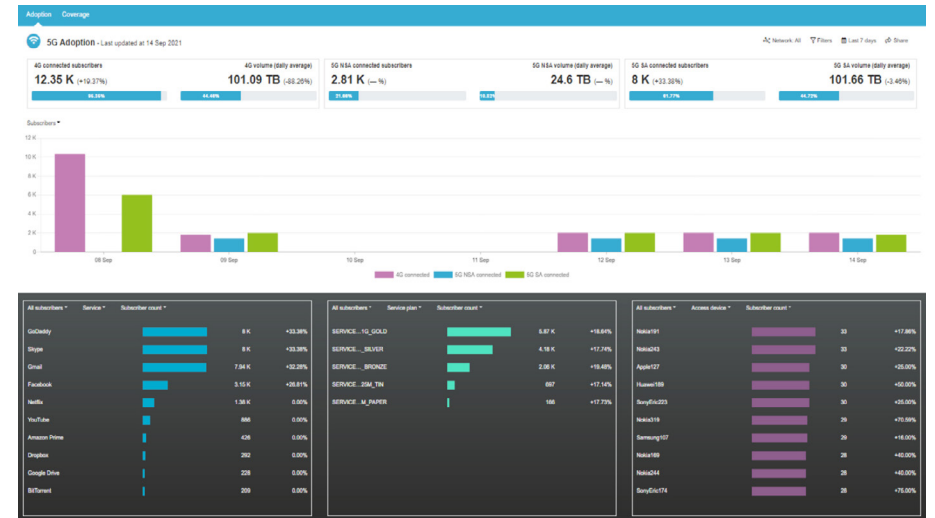
Note: IoT connections are not included in this graph. Fixed wireless access (FWA) connections are included.

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 download a PDF of our **5G Adoption Analysis Solution Brief**

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.

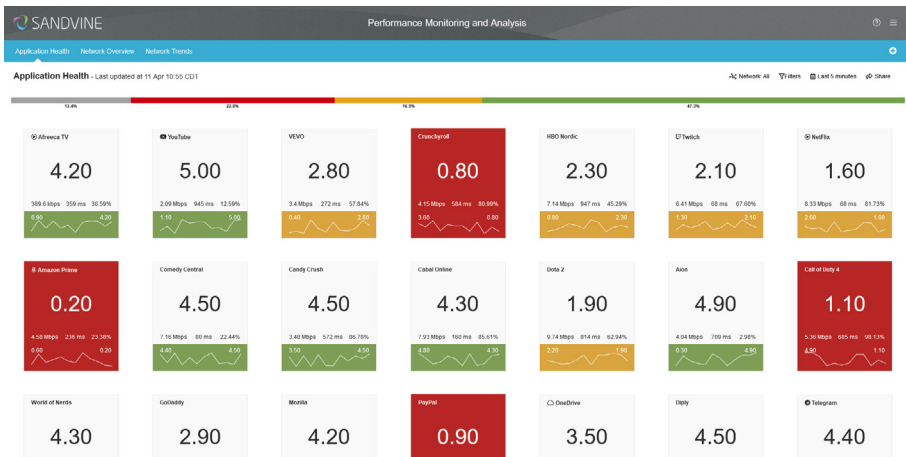
For operators, keeping today's networks in line with performance expectations requires rich, deep, broad, and timely insights to troubleshoot problems, prioritize operational activities, and determine the appropriate actions to rectify quality issues. With the right performance and operational metrics, 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

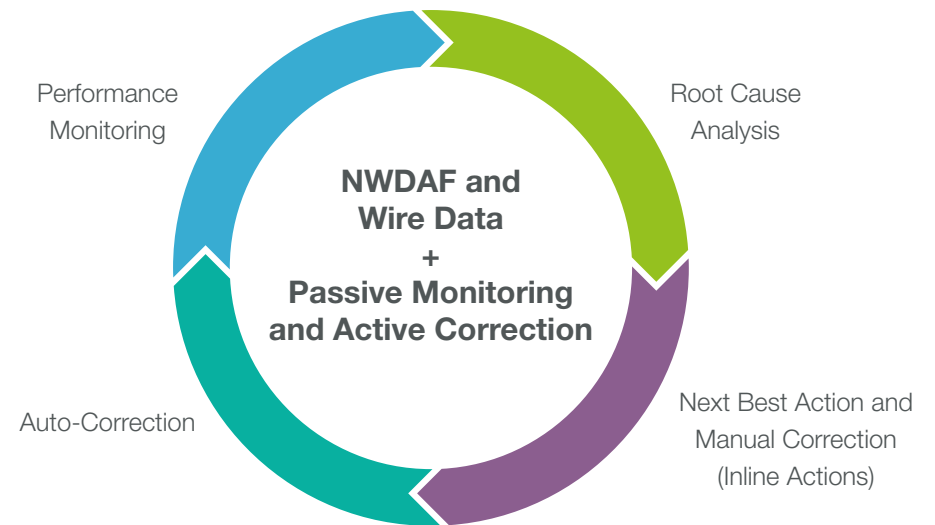


SOLUTION

Sandvine empowers operators with near real-time visibility and a historical view on application quality of experience (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, packet loss, and latency), 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 customers have what they need to quickly diagnose issues before they grow into service-impacting problems, and to respond appropriately should problems arise. Ultimately, end customers are more satisfied and operational efficiency increases.

 [Click here](#)

to download a PDF of our [Performance Monitoring and Analysis Solutions Brief](#)

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

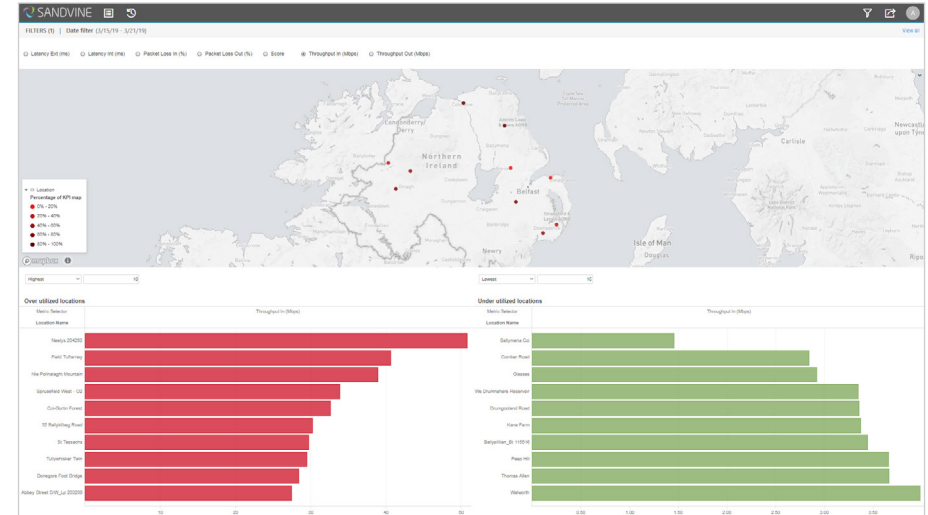
Understand the impact of applications on each individual network asset/location



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.

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 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.

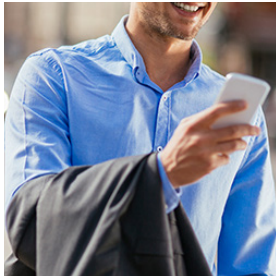
Sandvine’s Capacity Planning Analysis overview provides a location-based view of network performance to identify performance and quality hotspots that need investigation and/or investment



to download a PDF of our [Capacity Planning Analysis Solution Brief](#)

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, and packet loss) to guide customer experience management.

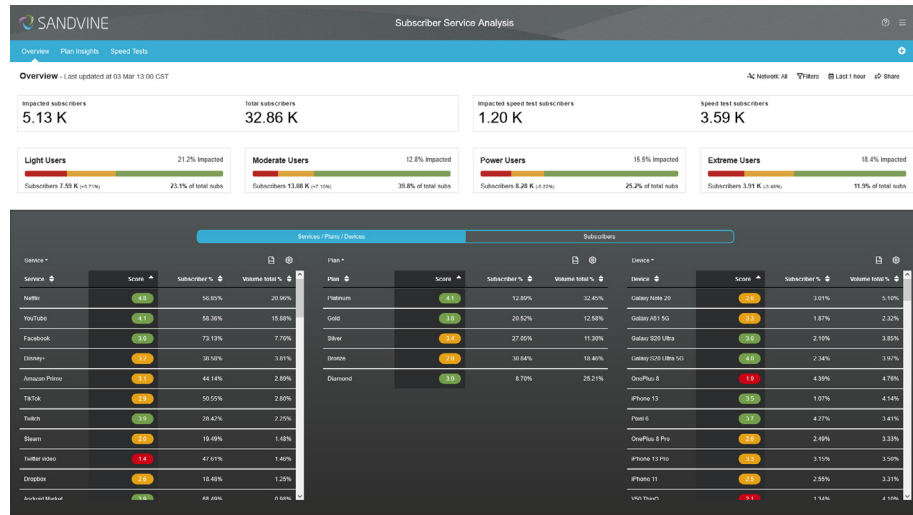


BENEFITS

- 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.

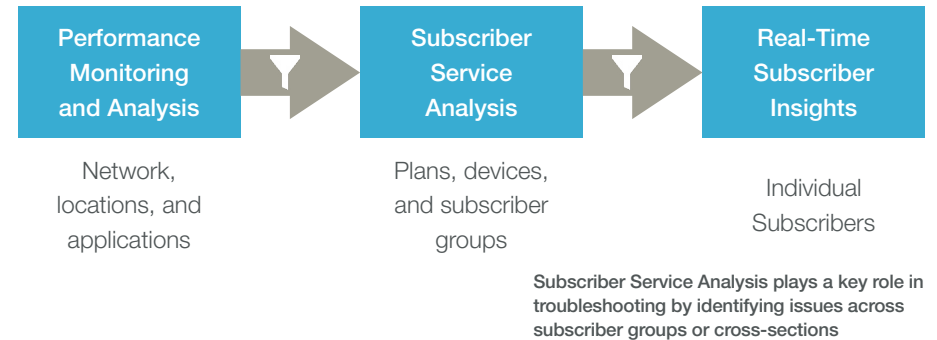
Subscribers are segmented for a better understanding of how they are using the network



SOLUTION

Sandvine's Subscriber Service Analysis gives historical and near real-time user-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 use case option takes a proactive, user-centric 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 download a PDF of our **Subscriber Service Analysis** Solution Brief

Real-Time Subscriber Insights

Proactive subscriber quality monitoring



BACKGROUND

Customer Care teams are feeling the pressure to help deliver the best possible customer experience for network subscribers. Teams need to put network experience into context when dealing with customer care incidents and a general understanding of network uptime is insufficient.

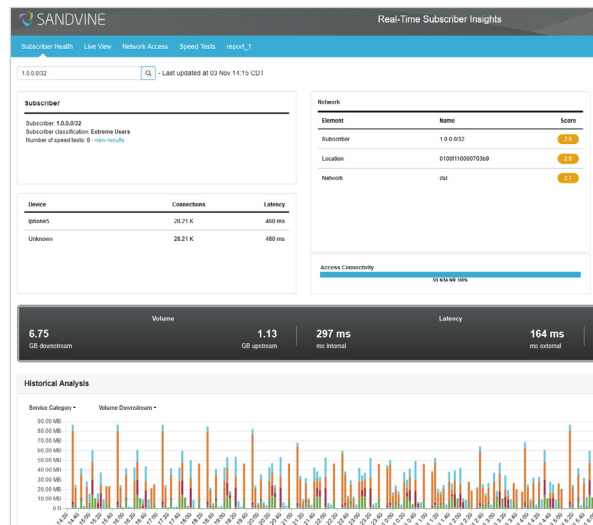
They require a complete picture of a subscriber's QoE. Without insight into the subscriber's network experience, resolving a bandwidth or connectivity issue in a timely manner can be difficult. This can result in expensive escalation to engineering resources as well as customer dissatisfaction, potentially leading to churn.



BENEFITS

- Improve first call resolution rates
- Increase customer satisfaction and quality of experience
- Reduce the associated customer retention and management costs

Understand individual subscriber customer experience on the network and put it into context to resolve a customer care problem



to download a PDF of our [Real-Time Subscriber Insights Solutions Brief](#)

SOLUTION

Leveraging Sandvine's real-time application and network intelligence, Real-Time Subscriber Insights provides a real-time and historical view into a subscriber's network experience that can be used to evolve service plans, isolate quality issues, usage overages, and billing disputes.

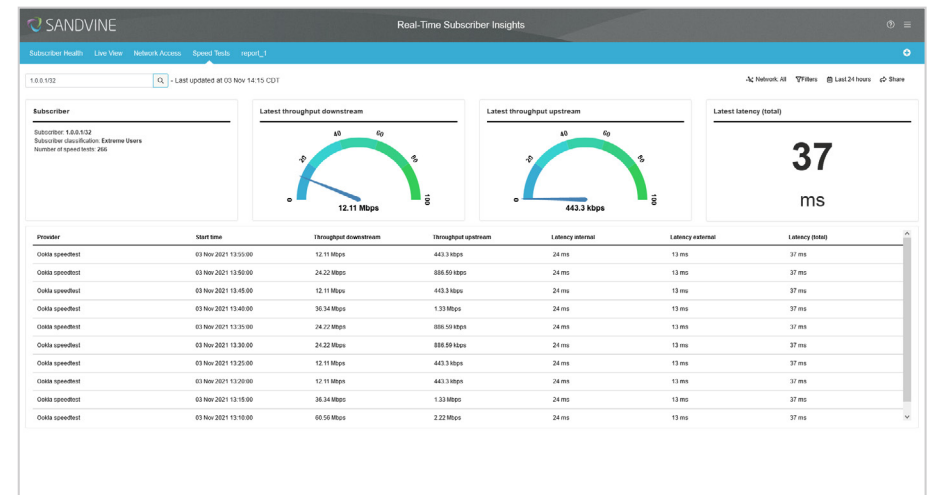
The solution is tightly integrated with the operational and business support systems of each operator. In addition to providing insights on subscriber experience, Real-Time Subscriber Insights delivers a full understanding of the customer's interaction with the network.

IMPACT AND RESULTS

By being able to monitor live service performance on the network and dive into an individual user's service, Sandvine's customers are able to troubleshoot application issues in real-time, directly improving customer satisfaction, and creating and evolving services.

Additionally, logging this performance information creates a valuable case history in the event that a customer calls to dispute the quality of service (QoS) delivered.

Real-Time Subscriber Insights provides a view on speed tests, including the results, as they are a great indicator customer experience satisfaction



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 Video QoE Analysis delivers powerful, actionable video insights, including encrypted video traffic.

At a per-flow level, this solution scores video QoE by combining existing KPIs (e.g., throughput, packet loss, and latency) 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

[Click here](#)

to download a PDF of our [Video QoE Analysis Solution Brief](#)

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.

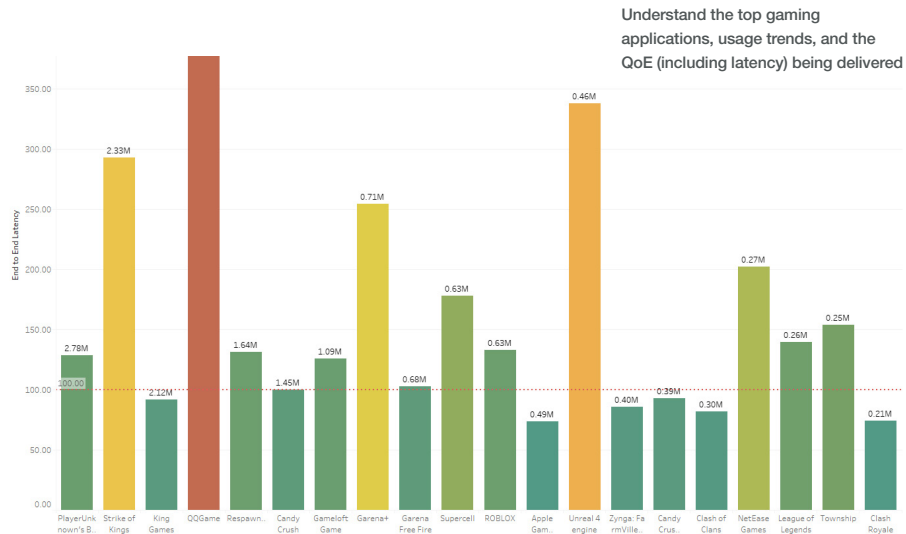
Gamers, both amateur and professional, are now even more focused on the quality of their network connection and how well it performs.

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



SOLUTION

Sandvine's Gaming QoE Analysis empowers operators with 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.

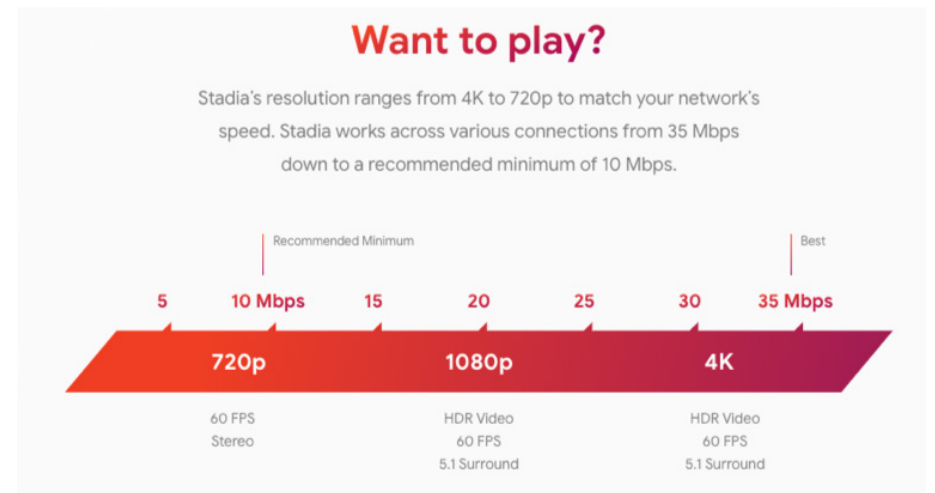
This use case leverages Sandvine's powerful contextual awareness, QoE scoring technology, and the largest gaming application identification library in the industry.

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



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Cyber Threat Analysis

Identify and quantify threats to users and network infrastructure



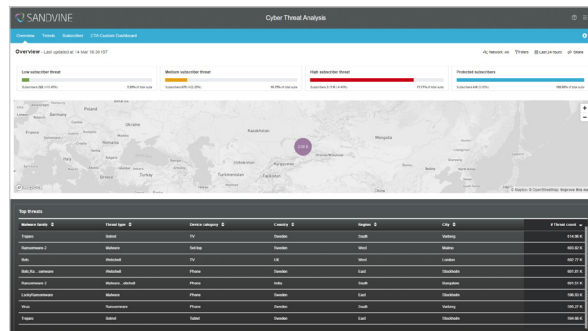
BENEFITS

- 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 Cyber Threat Analysis provides comprehensive analytics resulting from 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.



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[Cyber Threat Analysis and
Management Solution Brief](#)

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.

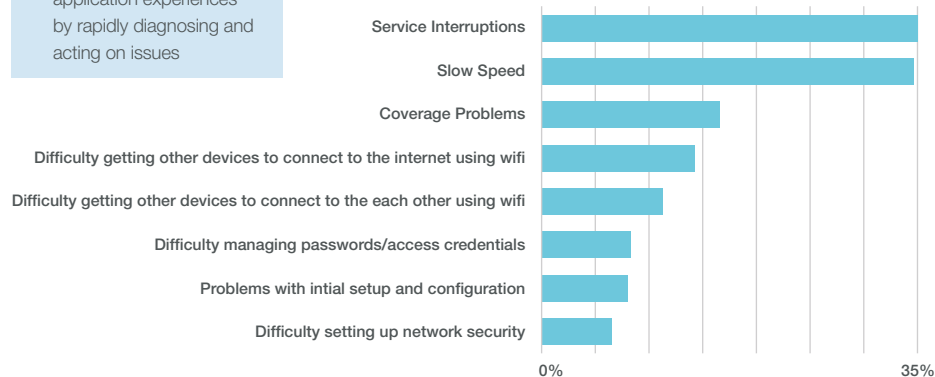
For operators, this lack of visibility and the criticality of good WiFi for consumers in today's environment has proven to be rather costly, whether through the direct cost of deploying unnecessary truck rolls, running inefficient customer call centers, or the indirect cost of customer churn.



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



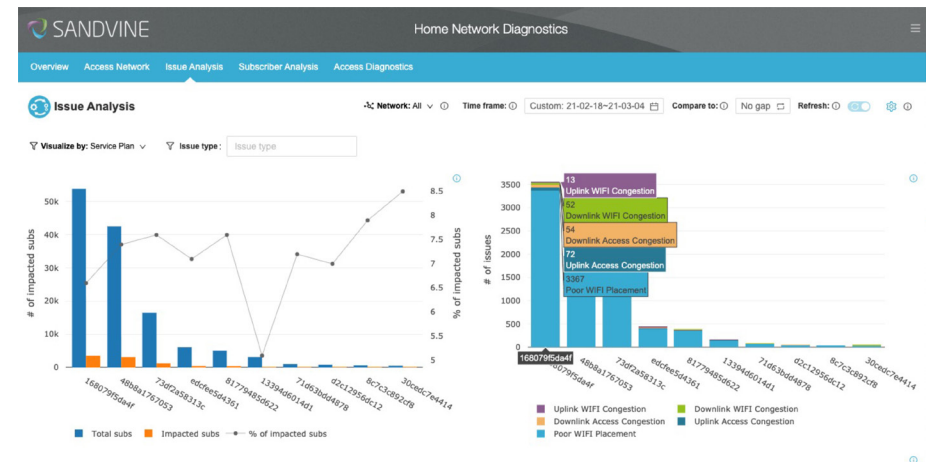
SOLUTION

Sandvine's Home Network Diagnostics delivers real-time insights into the root cause of WiFi-related issues. It uses key network performance characteristics and machine learning-powered intelligence to diagnose and interpret WiFi 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.)



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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.



BENEFITS

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

SOLUTION

Sandvine offers the industry's most precise congestion management solution, enables network operators to balance the traffic and distribute network capacity fairly between users to ensure maximum delivered QoE.

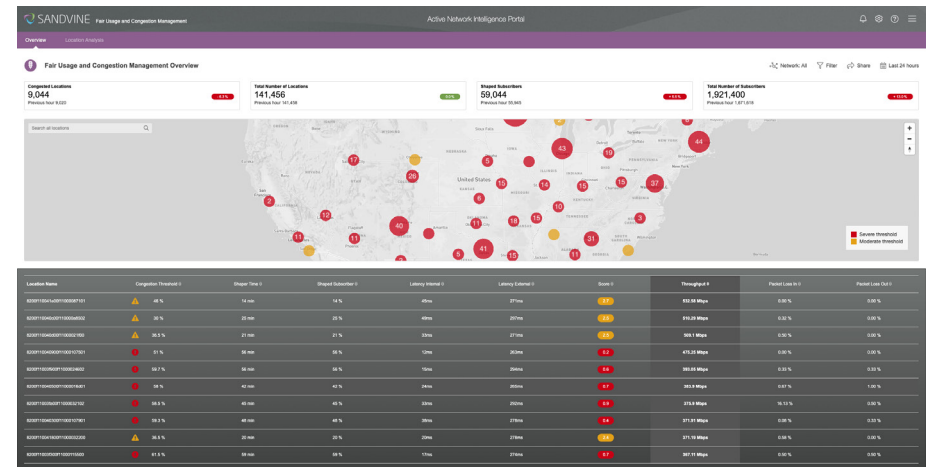
A real-time feedback loop measures the QoE at each location in the network; if resource congestion threatens QoE, then precise management policies take action. The solution is also optimized for each type of network access technology, and operates

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 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.



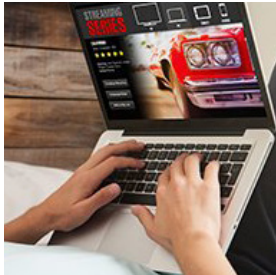
The Fair Usage and Congestion Management dashboard visualizes congested areas, including the number of suffering subscribers, and shows the change in bandwidth and QoE after the policy is enabled



to download a PDF of our Fair Usage and Congestion Management Solution Brief

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, especially with 4K and 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.

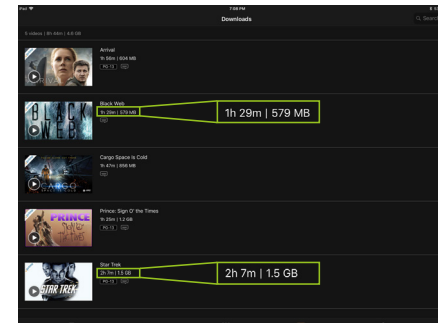
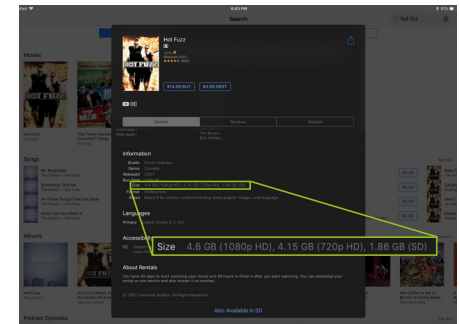
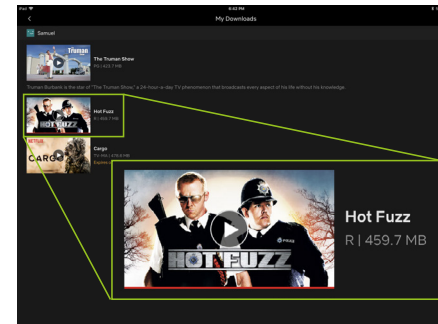
There are opportunities for operators to benefit from video streaming; however, they need a solution not only to accurately identify all streaming services, but also to manage the diverse behavior and bandwidth requirements for optimal QoE for video and other high-priority services, especially during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

60% InterNet TRAFFIC is video

SOLUTION

Sandvine enforces intelligent rate 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 download a PDF of our Video Streaming Management Solution Brief

Heavy User Management

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



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%

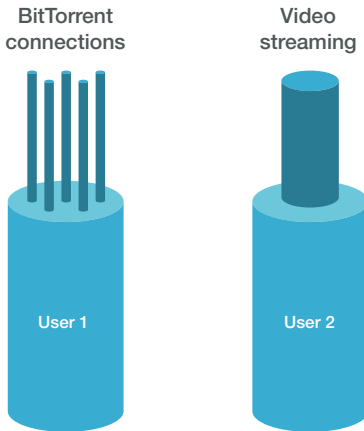
Regardless of the specific breakdown, the imbalance of bandwidth can create complications and complexity for network planning, service business models, and profitability.



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



Differences in bandwidth usage caused by application behavior

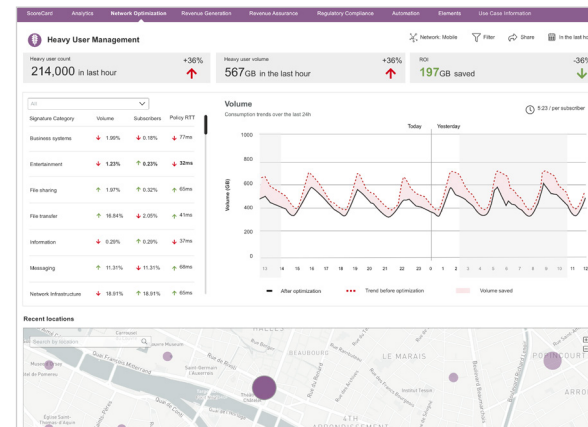
SOLUTION

Heavy 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.



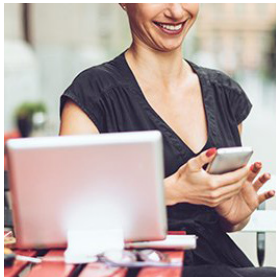
With the Heavy User Management dashboard, operators can drill down by different attributes (for example, by application or by the locations of heavy users) and view the bandwidth savings and QoE improvements from Sandvine's flexible policy management

 [Click here](#)

to download a PDF of our **Heavy User 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

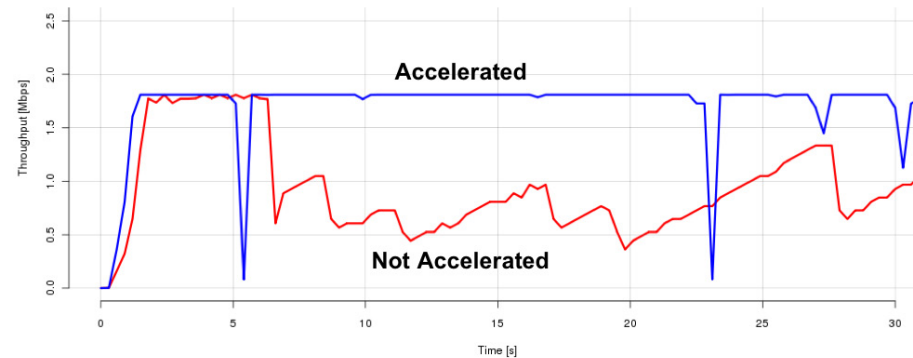
Sandvine's TCP Optimization exerts greater control over TCP, accelerating performance even in networks that have already deployed congestion, video streaming, or network link management solutions. Focusing solely on the transport layer, the solution demonstrates marked improvements in performance.

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

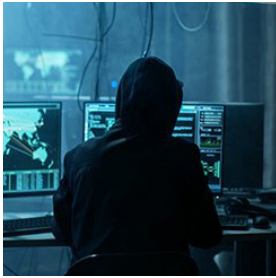


 [Click here](#)

to download a PDF of our TCP Optimization Solution Brief

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

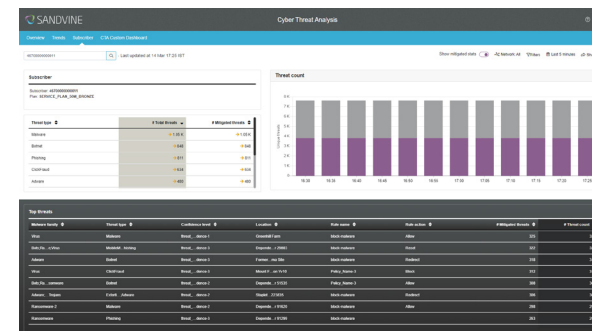
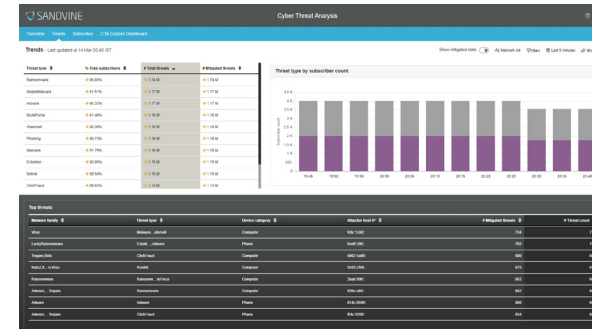
Positioned in the network protection domain, Sandvine's Cyber Threat Management adds to the Cyber Threat Analysis use case capabilities the ability to execute real time mitigation policies to block malicious threats, and therefore protect subscribers from a range of network threats and malicious traffic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

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

Source: cdgportal.com

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 threat 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.

 [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

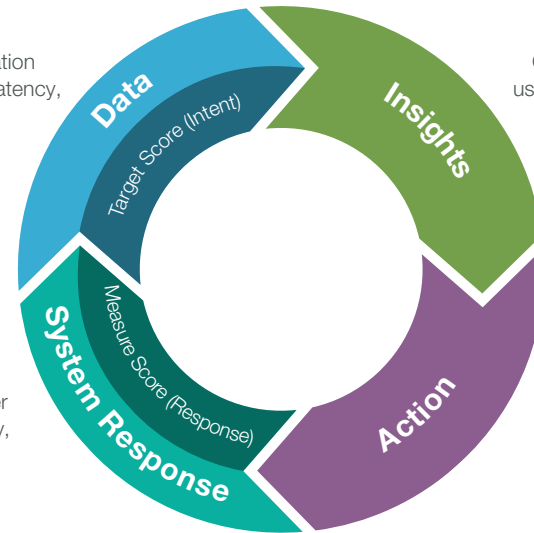
Sandvine's closed-loop automation use case arms fixed operators with an intelligent approach to managing network congestion based on intended application performance. Intent-Based Congestion Management sets a minimum and target QoE for each application or service category, preventing poor performance 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](#)

5G Slice Load Analysis

Network slice analysis for automated assurance



BACKGROUND

Network slices are one of the biggest changes introduced with 5G networks. They play a significant role from unlocking additional revenue opportunities to ensure critical services are delivered without compromise.

Although there is a lot of buzz around the game-changing opportunity that slices present, they also bring several challenges. Specifically, slices need to be continually monitored and managed to ensure they deliver the required SLAs.

No two slices are the same and therefore it is important to understand which slice should be assigned based on the user requirements. What is critical for slice management is having an end-to-end picture on how well they are performing and what that means from a user perspective.

Similar to other 5G functions, slices have the ability to leverage predictive analytics and automation to reduce manual intervention, but like most close-loop systems this is dependent on the accuracy and relevancy of the data available.



BENEFITS

- Understand and improve slice performance.
- Facilitates innovation and monetization of net new enterprise and consumer slice-based services
- Enables zero-touch automated slice assurance

Projected Growth in Slicing Market



5G Slicing set to propel new growth in the industry and generate revenue of US\$20 Billion by 2024

Source: ABIresearch

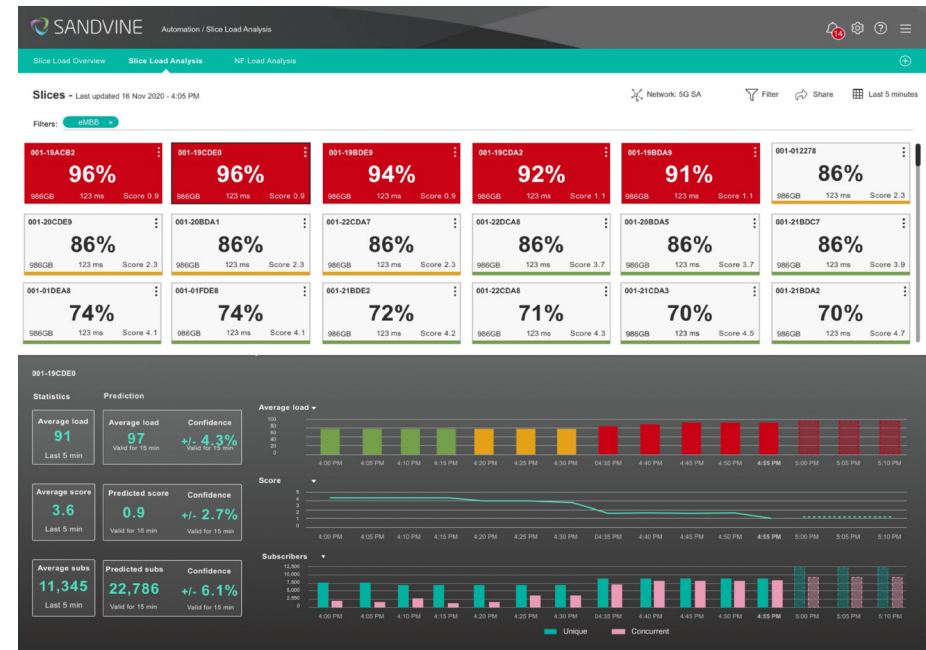
SOLUTION

Sandvine offers slice-level operational intelligence to other network analytics consumers (e.g., PCF, AMF, etc.). This use case helps operators collect, calculate, and recommend which slices to assign based on augmented information that takes user and application KPIs into consideration and not just the standard NF performance data available from the network repository function (NRF).

By augmenting the standard data, operators have more of a relevant view of slice performance and load, which translates into actionable intelligence that can be sent to consumers like network slice selection function (NSSF) or access and mobility (AMF) for selecting the right slice for the user or the OAM for automated slice management.

IMPACT AND RESULTS

With Sandvine's enriched slice analytics, operators can make more informed decisions on the selection, operation, and management of the slices.



The performance for each slice instance can be monitored showing the load and other KPIs like volume, latency and average score when Sandvine ANI is deployed and used for enrichment

 [Click here](#)

to download a PDF of our **5G Slice Load Analysis Solution Brief**

5G NF Load Analysis

Enriched NF load data for proactive user QoE protection



BACKGROUND

Although the journey to cloud has been a topic of investment for several years, there has been no real catalyst to drive immediate adoption – until now. For the promises of a 5G network to be realized, there is an inherent need for cloud-based architecture.

As much as cloud-based infrastructure simplifies some previously experienced operational challenges, such as spinning up new network functions (NFs) to meet demand, it also adds more complexity to the network.

This is where network automation can have a huge impact. Specifically, automation can be leveraged when managing NF lifecycle-related actions like adding, scaling in/out, retiring NFs or selecting as part of the call flow.

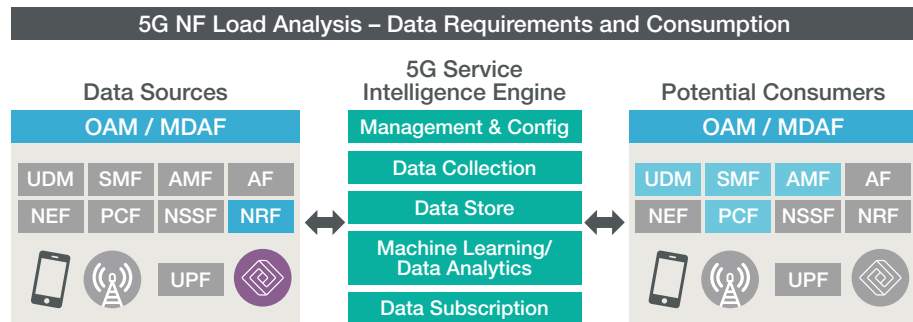
However, the only way to reap the full benefits of automation in a 5G network is to have it based on predictive analytics, where pre-emptive actions can be taken to ensure smooth network operation and quality of experience (QoE).



BENEFITS

- Support for single or multiple slices and regions
- Intuitive dashboard to understand the trends and validate ROI

Data sources and data consumers for NF Load Analysis in 5G networks

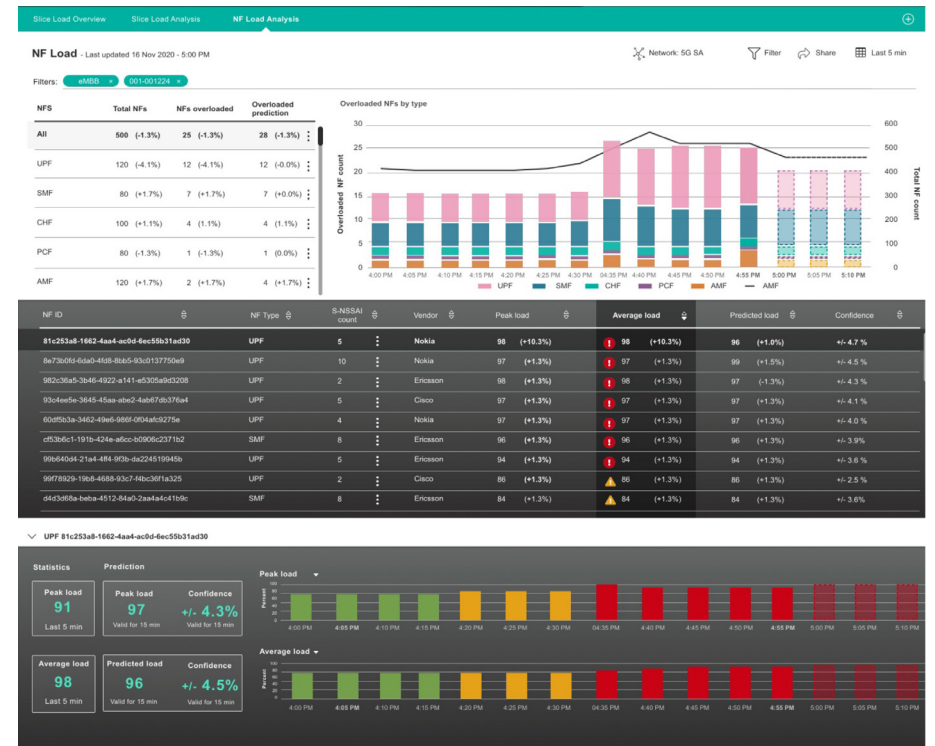


SOLUTION

Sandvine delivers this 3GPP-standard 5G use case – NF Load Analysis – and enriches it with the full power of Sandvine’s application and network intelligence when conducting UPF load analysis. It augments the standard UPF performance information, by taking actual network conditions into account. This enriched intelligence directly translates into providing real-time operational insights for enabling use cases such as NF selection, NF load balancing, and enriched UPF selection. It also adds specific QoE data to ensure actions are targeted, improving customer experience.

IMPACT AND RESULTS

5G NF Load Analysis empowers operators to enhance their network automation and service orchestration driven by real-time and machine learning-based analytics. It gives an accessible, user-centric view, supporting operators in their continued network operation center (NOC) to service operation center (SOC) transformation.



NF KPIs: Serving slice, vendor, peak load (and change from the last time period), average load (and change from the last time period), load predictions (and confidence of the predictions), load trend

[Click here](#)

to download a PDF of our 5G NF Load Analysis Solution Brief

5G Observed Service Experience

QoE-based insights for predictive service experience



BENEFITS

- Provides frequent (5 min) scoring data (MOS) from a single source for thousands of applications including enterprise/IoT applications
- Enables machine learning-driven analytics use cases by providing insight into service experience by slice, UE, group of UEs, application, and application group
- Requires no dependency on external AFs to provide service experience

BACKGROUND

For today's networks, service differentiation relies solely on delivering and managing the right user experience for applications and services users care about. This differentiation has become more critical with the introduction of 5G services. For mobile operators, 5G is less about selling "network capability", but rather delivering the right application quality of experience (QoE), effectively unlocking the potential of 5G services. Prioritizing application QoE means operators and their enterprise customers will have to understand what users are experiencing and accurately measure it in real time.

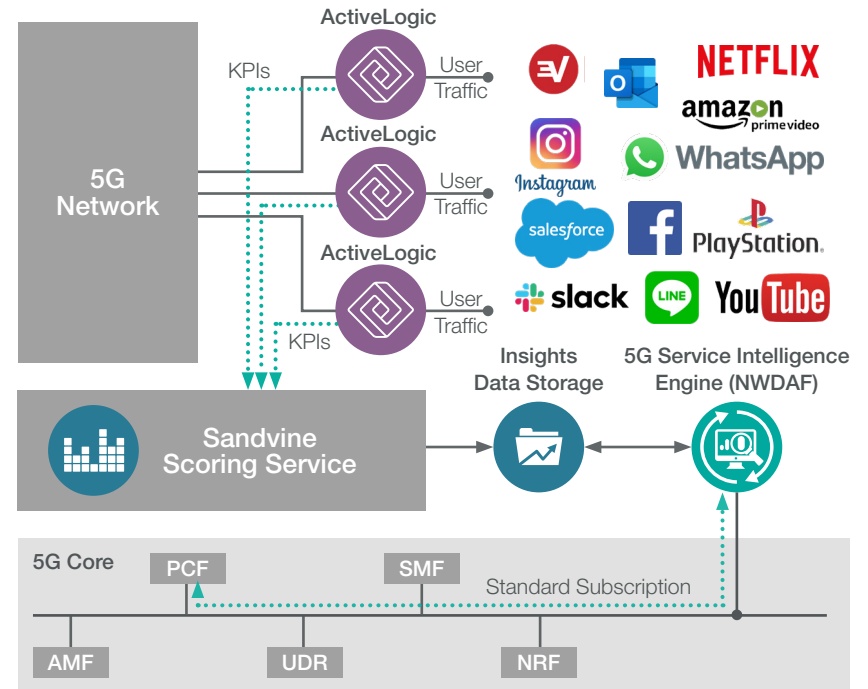
Observed Service Experience, one of the nine Analytics IDs specified by 3GPP in R15/16, relies on the Network Data Analytics Function (NWDAF) to collect mean opinion score (MOS) from individual Application Functions (AFs) for hundreds of key applications if not thousands. Unfortunately, 3GPP Rel-16 lacks the definition of a robust DPI engine in the network for application detection. It also relies on individual AFs for providing traffic classification data, and as a result does not offer a solution for obtaining service experience for that application from the network. Due to this limitation, 3GPP Rel-16 only considers the applications that are being served by AFs present in the network, which could be very few.

SOLUTION

Sandvine's 5G Service Intelligence Engine, an enriched NWDAF, offers Observed Service Experience analytics service in the form of statistics and predictions, providing real-time service experience to different 5G Core network consumers: NFs, AFs, and operations, administration, and maintenance (OAM).

With the existing QoE scoring capabilities within Sandvine Application and Network Intelligence (ANI) solution, Sandvine offers the Observed Service Experience analytics service while

acting as the single or additional source of metrics/KPIs needed for the analytics service. As per 3GPP, every AF should provide the application MOS/QoE to NWDAF by user equipment (UE) or by UE group. When Sandvine ANI solution is deployed, it becomes the trusted AF for all internet applications, providing per service MOS (QoE Score) in a more homogenous manner. Sandvine 5G Service Intelligence Engine consumes this score/MOS for learning service experience with multiple dimensions like UEs, groups of UEs, network slice, etc.



IMPACT AND RESULTS

Mobile operators can benefit from understanding the end-to-end application connectivity quality, which is critical for delivering promised SLAs. These quality insights can be utilized by many consumers in the network like PCF, CHF, NSSF, Slice SLA Manager and OAM. For example, consumers like PCF can adjust QoS of a UE or group of UE based on the quality of the service a slice, UE, group of UE and a location is experiencing. Additionally, operators can leverage 5G Observed Service Experience for other use cases that rely on QoS provisioning and adjustment and influencing UE related policies.



to download a PDF of our **5G Observed Service Experience 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

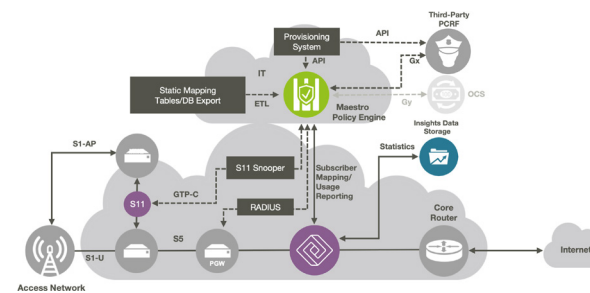
When deployed with Sandvine’s application and network intelligence platform and Quota Manager, a number of advanced options can be monetized to bring more value to users, increase ARPU for operators, and even improve network efficiency.

- **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

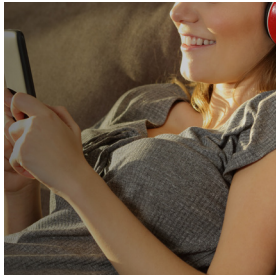
With Usage-Based Services as the foundation, operators can launch plans with limitless service creativity, improving ARPU, and offering more value to users. By deploying Usage-Based Services with Sandvine’s Quota Manager, operators can add advanced options to create further differentiated service offerings,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

 [Click here](#)

to download a PDF of our **Usage-Based Services Solution Brief**

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.

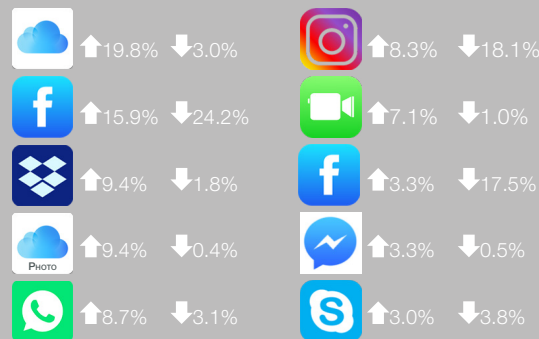
Application-based plans have a similar appeal to network operators. Offering plans based on in-demand applications that have a prioritized quality of service (QoS) or larger quotas can create value and increase revenue for the operator. The key distinction between zero-rating and application-based plans 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

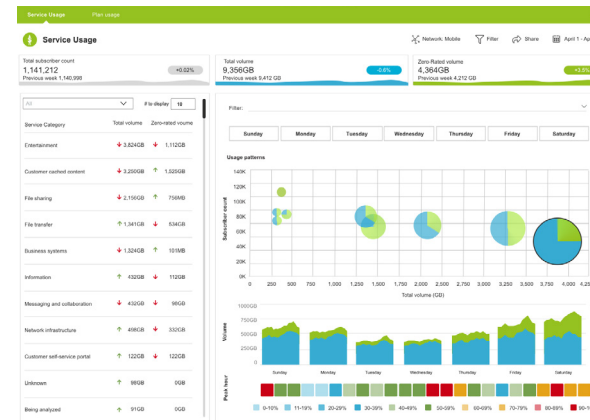


SOLUTION

With industry leading application identification and classification, 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 download a PDF of our **Zero-Rating and Application-Based Plans Solution Brief**

Parental Control

Give peace of mind with content and application management for minors



BACKGROUND

The internet has a lot of content and not all of it is appropriate for children. Some content is also fraught with security risks; children do not always know the risks associated with clicking on links that can put their devices and accounts in threat of phishing or other malicious techniques. With the proliferation of devices available to children – mobile phones, tablets, gaming consoles, and PCs – device-based solutions aren't up to the task.

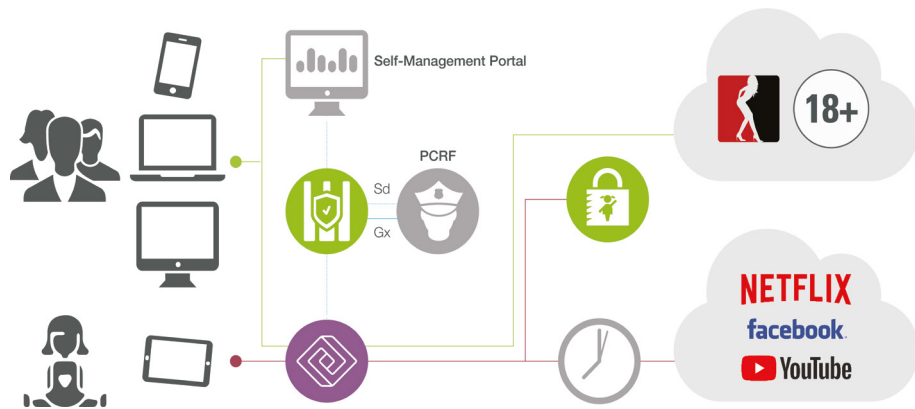
Aside from protection from web- and application-based content, parents often want to manage daily usage to minimize distractions from schoolwork and other activities. Application access and time-of-day policies can create a distraction-free time to complete schoolwork without constant notifications.



BENEFITS

- Gain users with high-margin family plans
- Upsell higher ARPU parental control-enabled offerings

There is a growing need for parental control as children are at more online risk than ever before



SOLUTION

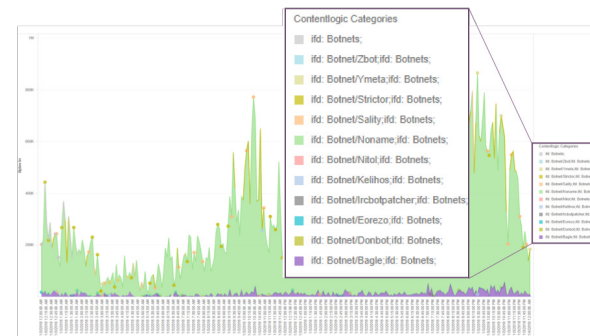
Sandvine's Parental Control use case is a highly personalized, differentiated network-based use case that can generate revenue and deliver "good citizen" branding for operators. As a network-based approach, it goes beyond basic URL filtering; it also delivers application and time-of-day control for a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

This use case is built on Sandvine's market-leading ability to identify users and traffic, with its frequently updated signature library, and its highly accurate and granular policy enforcement capabilities.

What really ties this use case together is Sandvine's set of APIs that can integrate all components to an operator's self-management portal. This empowers end-users to configure their own policies – from a category perspective as well as time-of-day policies.

IMPACT AND RESULTS

Parental Control enables network operators to offer a network-based solution as a VAS or service differentiator that drives revenue, as parents are willing to pay for peace of mind when it comes to their child's safety and well-being.



Sandvine's ContentLogic solution delivers standards-based, highly interoperable integration with any policy infrastructure

ContentLogic

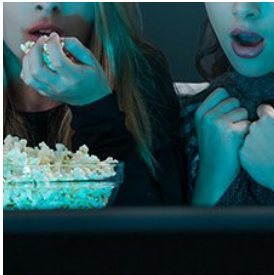
ContentLogic enables flexible content categorization of internet sites, enabling sophisticated policy enforcement or content-based charging.

 [Click here](#)

to download a PDF of our [Parental Control Solution Brief](#)

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.

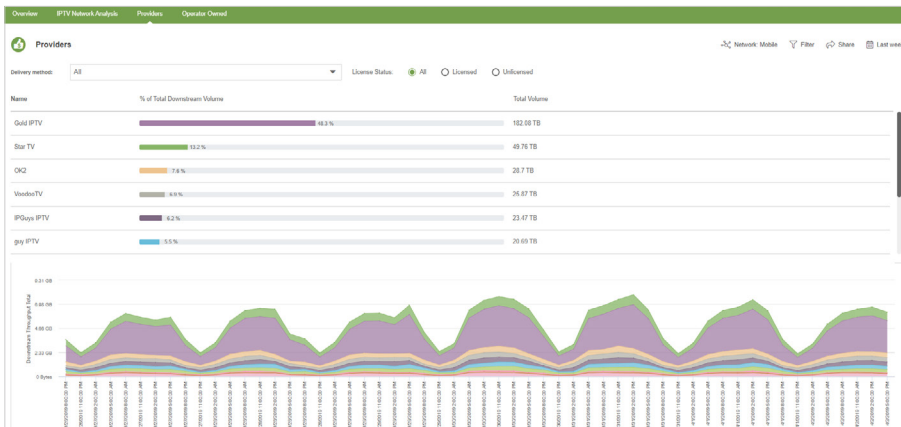
The continued adoption of unlicensed video and TV streaming services could lead to increased cord-cutting, significantly impacting top-line revenue and overall profitability, and, by extension, undermining the very business models that keep networks operating. As a result, network operators who license 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

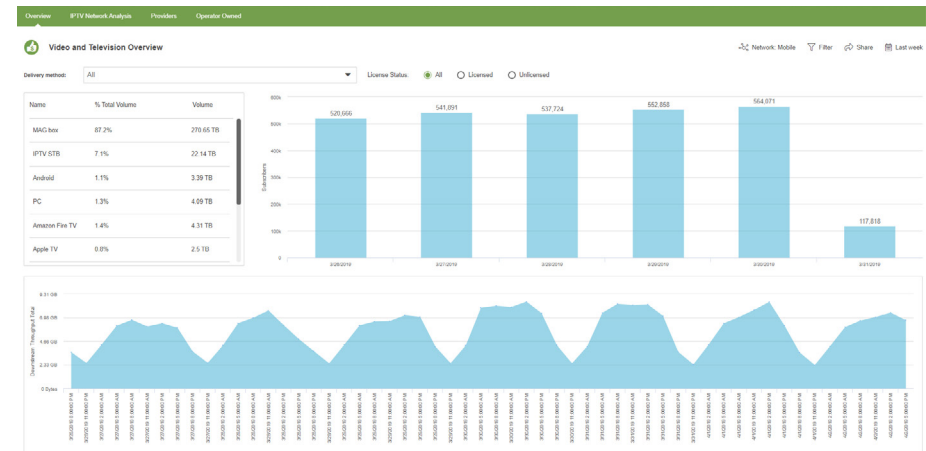


SOLUTION

Sandvine's 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 download a PDF of our **Video and Television Fraud Management Solution Brief**

Data Revenue Leakage Monitoring

Identify misconfigurations and oversights that cause revenue loss



BENEFITS

- Identify leakage that could result in CAPEX spend due to misconfigurations
- Reduce OPEX spent on data collection with a more authoritative network intelligence dataset
- Recover revenue from misconfigurations and leakage

What was your last year's value for the KPI "% of revenue losses" before the recovery procedures calculated versus revenue?

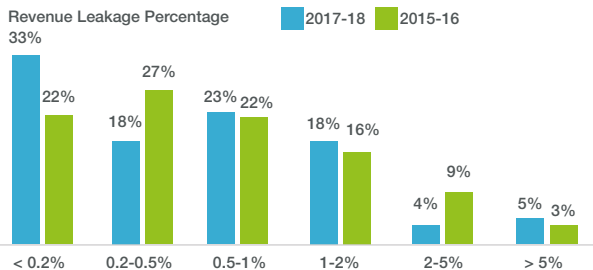
Credit: TM Forum Revenue Assurance Survey 2017/2018

BACKGROUND

Revenue leakage eats away at the bottom line of network operators. Unlike losses due to fraud, this leakage can be caused innocently enough by a number of factors: misconfiguration of network elements, software upgrades that cause undetected problems, and unknown functional deficiencies.

With the increasing complexities of today's network and of the data services being offered to users, leakage is quite common. Operators need better data with actionable context to determine if leakage is occurring on their network and whether they have to increase their use of machine learning and automation to detect leakage.

TM Forum – Revenue Assurance Metrics		
Data Quality	Revenue Leakage	RA Process Effectiveness
Percentage of validated data	Percentage of customer bills adjusted in a bill cycle	Percentage of the recovered revenue value
Percentage of customers included to reconciliation	Percentage of unbilled and underbilled revenue over total revenue	Quantitative description of the recoverable revenue value
Percentage of misaligned customers	Value of unbilled and underbilled revenue over total revenue	Quantitative description of the recoverable revenue value
	Percentage of billable xDRs suspended or errored/Total xDRs	Quantitative description of the average time for recovery of revenue
	Ratio of billing xDRs records to network xDRs records	Percentage of xDRs successfully recovered, processed and billed after recycling over total xDRs
	Percentage of errors on fulfillment orders	Percentage of recovered and recoverable customer revenue over total revenue
	Quantitative description of the cost of assets that were unused or stranded	Quantitative description of the unfiled error fixes orders
	Percentage of verified and accepted third-party settlement reports over total S/P settlement reports	



SOLUTION

Sandvine provides operators an additional set of eyes in the network to accurately measure usage and to detect problems in the control and charging planes. This insight provides a point of comparison for other systems, and also serves as a fall-back redundancy measure that preserves charging capabilities in the event that other systems fail. The granularity of Sandvine's network intelligence simplifies the process of reconciling revenue leakage, as it can give insights on where the OSS system is incorrectly identified – whether the issue is plan, network, or configuration-related for users whose behavior is unusual.

IMPACT AND RESULTS

To optimize business, it is imperative that operators swiftly identify the causes of leakage. Ideally, operators should employ preventative measures. Sandvine's capabilities empower operators to identify and stop leakage, preserving valuable revenue.



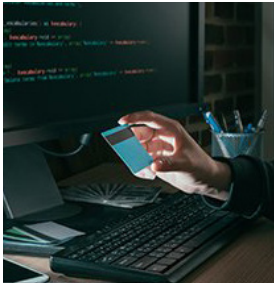
Sandvine can help operators understand usage patterns to identify irregularities and misconfigurations that can cause leakage

 [Click here](#)

to download a PDF of our **Data Revenue and Leakage Monitoring Solution Brief**

Zero-Rated Fraud Management

Get paid fairly by detecting and mitigating a range of zero-rating fraud techniques



BENEFITS

- Identify revenue impact of zero-rating exploits
- Mitigate fraud and recognize legitimate revenue

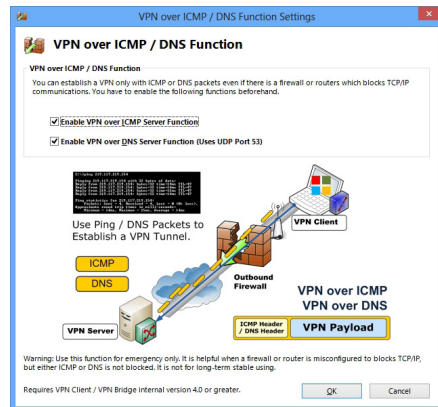
BACKGROUND

Network operators are leveraging zero-rating as a high-value offering to attract users to their service offerings. Zero-rated social networking, video streaming, and audio streaming are all common offers that fixed and mobile operators are using to give users a sense of unlimited and personalized services.

However, zero-rating solutions that rely on coarse-grained identification techniques are open for exploits by unscrupulous users, directly affecting a network operator's revenue. Solutions need to have high accuracy, and application and content identification needs to be frequently updated to ensure that revenue can be recognized despite exploit attempts like HTTP header injection, domain fronting, and DNS spoofing or tunneling.

Excerpt from Northeastern University study on BingeOn zero-rating: <https://bit.ly/2PFJSTr>

"We realized we could make any network traffic zero-rated by just putting the right text in the right place. It's potentially an open cash register that people can take from."
David Choffnes, Assistant Professor



An example of a commercially available DNS/ICMP tunneling client

SOLUTION

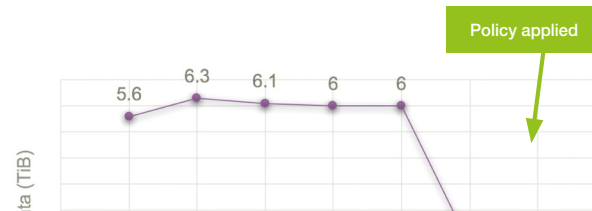
Sandvine's Data Fraud Management use case leverages best-in-class traffic classification, analytics, and policy enforcement to detect and mitigate zero-rated fraud techniques to preserve legitimate revenue for network operators.

The use case includes:

- Traffic classification that goes far beyond what traditional and embedded deep packet inspection systems can deliver, including advanced application fingerprinting for zero-rated applications
- A range of enforcement options to empower network operators to respond appropriately when fraud is detected
- Targeted analytics to provide insights into the prevalence of data fraud and the impact of mitigation policies

IMPACT AND RESULTS

Network operators who implement Sandvine's Data Fraud Management solution can confidently introduce the zero-rating features that their customers want, and be confident that zero-rated fraud can be managed.



A real-world example in which 6TB of daily fraud traffic was detected and shut down by applying the appropriate policy

[Click here](#)
to download a PDF of our **Data Fraud Management Solution Brief**

Interconnect Bypass Fraud

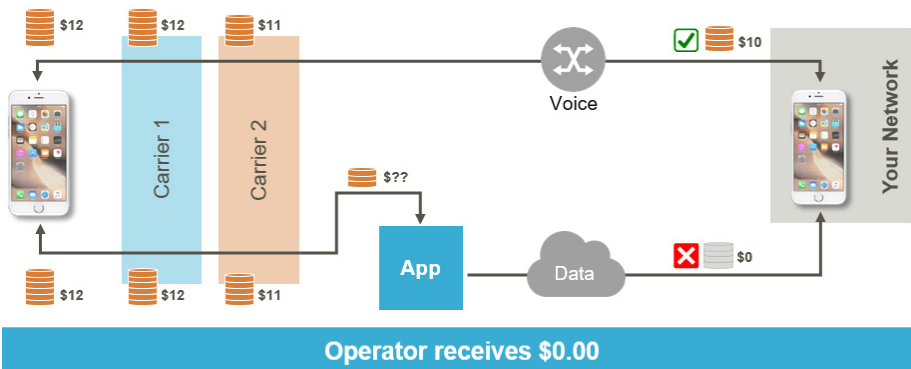
Protect revenue against fraudulent voice services



BENEFITS

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

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



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

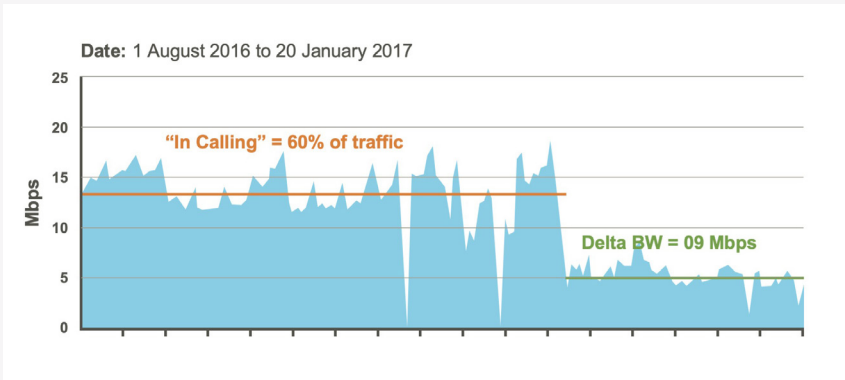
SOLUTION

Sandvine's 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.

Fraud analytics and enforcement



These are examples of the level of detail provided by Sandvine's Interconnect Bypass Fraud use case:

- Identified the group of IP addresses that were involved in the fraud
- A high volume of VoIP traffic was observed for a particular IP address
- A full breakdown on the total Viber traffic into VoIP to VoIP and Viber in calls
- 60% of the traffic was identified as Viber In

 [Click here](#)

to download a PDF of our [Interconnect Bypass Fraud Solution Brief](#)

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](https://twitter.com/Sandvine).



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