SANDVINE

Performance Monitoring and Analysis

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

PERFORMANCE MONITORING AND ANALYSIS DELIVERS:

Interactive Network Troubleshooting
Review network performance by service and location to help diagnose network problems

Network Quality Monitoring
Leverage Sandvine's Scoring technology to identify network quality hotspots

Breadth and Depth
View aggregated insights from network-wide key performance indicators to granular location (or slice), subscriber, plan/tier, and device-specific measurements

Contextual View of Delivered QoE
Regardless of access technology, converged network and application performance is correlated based on QoE relevant metrics

MARKET OVERVIEW

The expectations of today's consumer when it comes to network performance are largely driven by the application experience they are receiving, which aligns with the prominent role of applications for business, entertainment, connected devices, and general communication.

However, applications are now far more complex and sensitive to network issues than ever before and users' quality expectations continue to increase, causing them to complain quicker when issues arise. More importantly, users will often churn due to poor performance over a longer period.

Therefore, it has become more important than ever for service providers to transition from a traditional network operation center (NOC) model to one that prioritizes applications and services (i.e., service operation center). However, a significant barrier facing service providers is the ability to accurately measure and assess the delivered quality of experience (QoE) by the network for a given application.

Historically, application QoE has been determined with basic network metrics (e.g., speed tests and throughput). This approach provides an incomplete and limited view as it doesn't consider all the network conditions impacting application performance.

At the same time, the nature of applications and how they respond to changing network conditions varies greatly between different applications or application categories. For example, cloud gaming applications are far more sensitive to latency, whereas video streaming requires higher throughput to deliver a good experience to users.

To satisfy the needs of consumers and enterprises, service providers need access to rich, deep, relevant, and timely data analysis to diagnose problems, prioritize operational activities, and inform actions. With the right long-term performance and operational metrics, service providers are empowered to make quick and accurate decisions versus playing a high-stakes guessing game when troubleshooting network issues.

USE CASE OVERVIEW

Sandvine's Performance Monitoring and Analysis use case is designed to give service providers near real-time visibility and a historical view of how their network is delivering applications to users across the network.

The use case goes beyond traditional network metrics and applies Sandvine's QoE scoring capabilities, which looks at throughput, packet loss, and latency for each application and assigns a score based on individual application requirements.
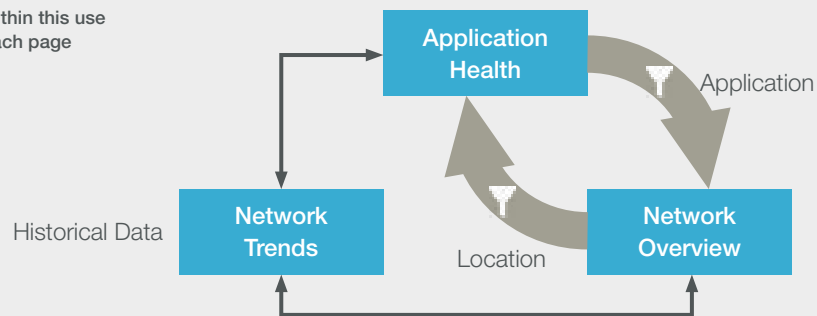
Performance Monitoring and Analysis

It leverages this QoE score and adds contextual data, such as location, device type, subscriber plan, to help service providers troubleshoot issues as they arise. Any abnormal traffic behavior is immediately visible – whether viral content, an attack in progress, or the start of a live event – and service providers can adjust their network configuration, resources, or policies to adapt to new conditions.

Tightly integrated dashboards provide insights into application performance and enables troubleshooting (**Figure 1**): Application Health; Network Overview; Network Trends

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Figure 1

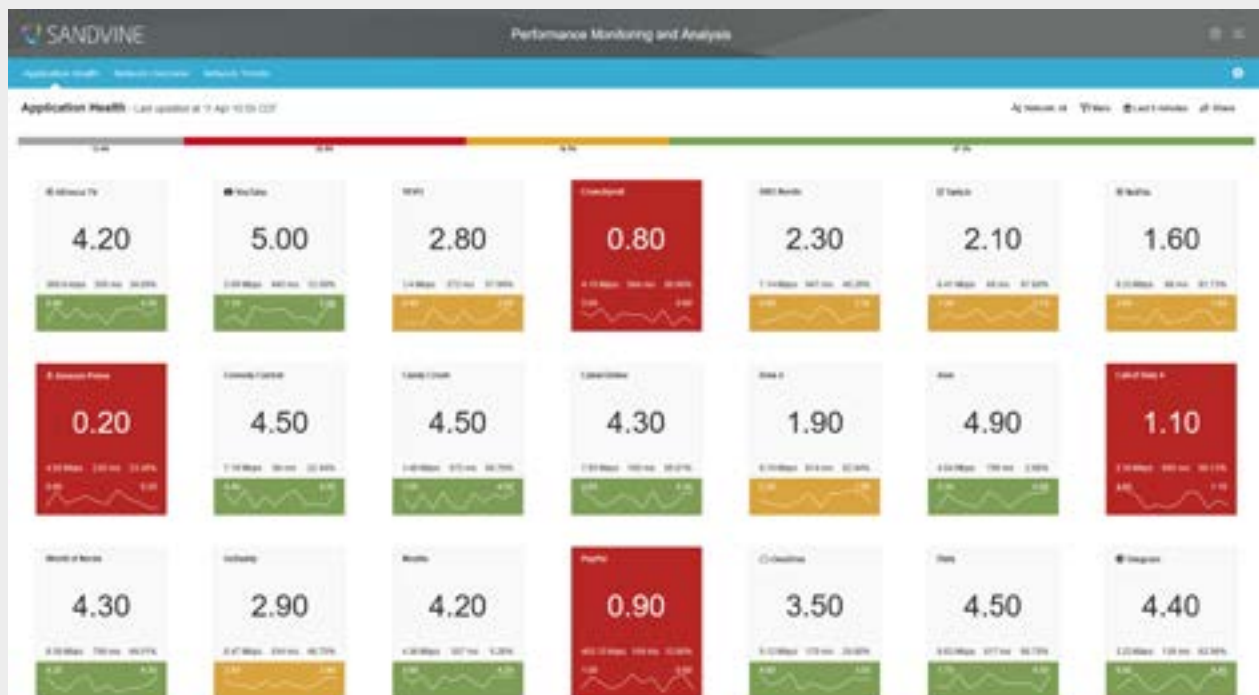Easily navigate between pages within this use case, carrying same context to each page

Application Health
This tile-based view gives an at-a-glance view of application performance on the network (**Figure 2**).

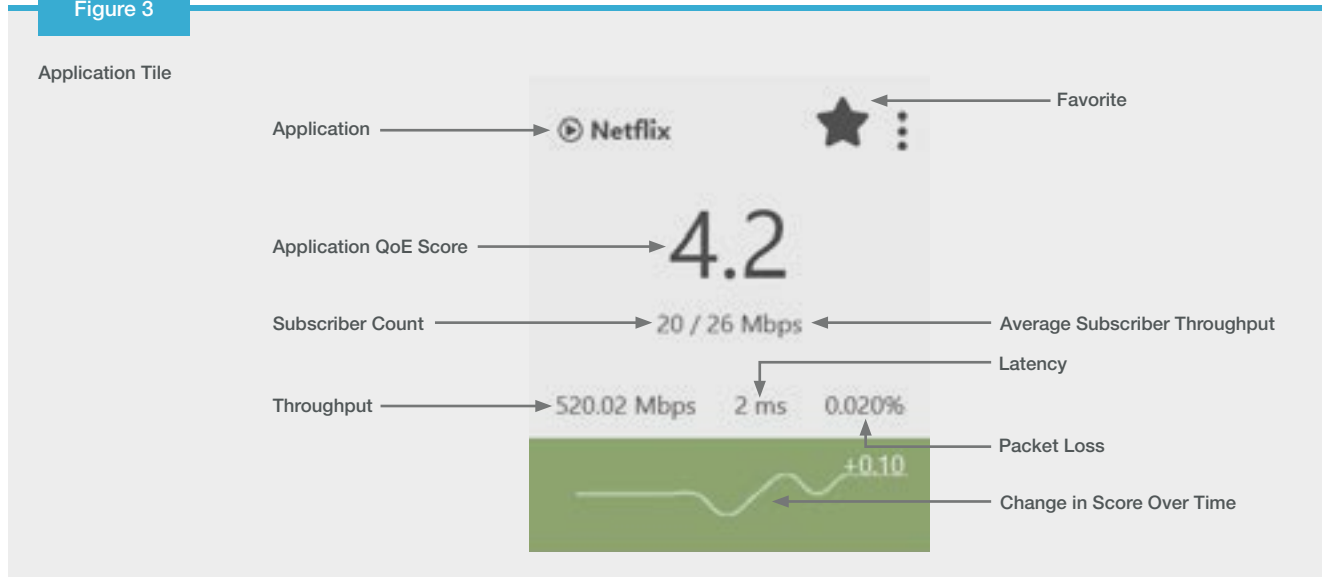---

Figure 2

Application Health

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Each tile (**Figure 3**) includes metrics:

- Score, current and recent values
- Subscriber count and average throughput
- Throughput, latency, and packet loss per application

Application Tile

These tiles can be sorted by volume, subscriber count, and score to provide focused views by:

- Majority of traffic across network
- Majority of subscriber base using services
- Poorly performing services

Additionally, a favorites list for up to 50 applications can be created, and selected applications are filtered to allow service providers to focus on what's important.

Toggle between application health and network overview to understand key applications that aren't performing well, drilling down on the locations where the performance is degraded or start with locations that have poor QoE and understand the applications causing the issue.

Network Overview

This view uses a scatterplot and table (**Figure 4 on following page**) to identify outlier locations, where there's high latency, poor score, etc. Once a location is identified and selected, updated location-specific data is displayed, configurable data grids will display selected metrics and dimensions, and users can switch between locations to see differences in performance.
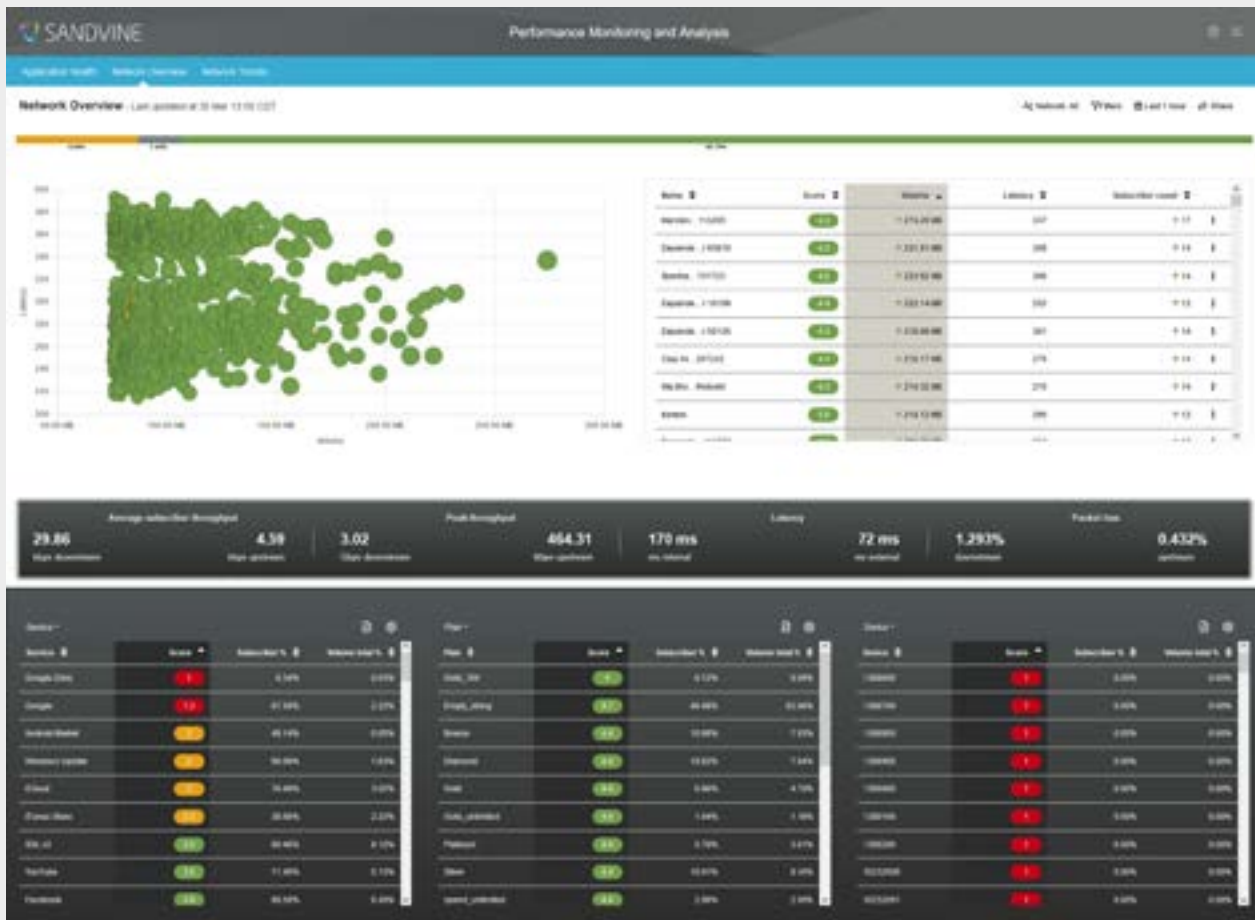
By default, the plot shows locations; however, for 5G SA networks it can also display slice instances, which get the same presentation, metrics, and dimensions within the rest of the page. This will allow service providers to view slice performance based on the applications and KPIs serviced via the slice.

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Figure 4

Network Overview

Network Trends

In addition to the near real-time data, this use case offers a long-term view via Network Trends. Service providers can view KPIs over time with selectable line charts. It is often filtered by location or slice, and shows the breakdown of applications in a table (**Figure 5 on following page**), with customizable metrics. It also provides some additional insights regarding plans, devices, and user classification. The page will show a previous interval's metrics for comparison (e.g., week over week or day over day).

Specifically, this view can help:

- Identify worst performing network locations, overutilized locations, and isolate persistent, chronic problematic sites
- Generate baseline scores for comparison when changing or upgrading the network
- Compare post-upgrade and pre-upgrade network performance based on location, application/service, etc. following maintenance work to improve operational efficiency
- Improve ROI by prioritizing capacity and quality upgrades

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Network Trends

End-to-End Troubleshooting

Sandvine's Analytics use cases give service providers the ability to identify and diagnose quality issues affecting different cross-sections of the network. Sandvine's data carries service providers through troubleshooting workflows across the network. There is a purposeful relationship designed for key use cases (**Figure 6**):

- Performance Monitoring and Analysis

- Subscriber Service Analysis

- Real-Time Subscriber Insights

Starting with Performance Monitoring and Analysis, which covers the network at large and is focused on locations and applications, a problem can be identified. Context of the diagnosed problem is carried over to Subscriber Service Analysis, where the identified network traffic is further analyzed by subscriber plans, devices, and subscriber classifications. When a narrow cross-section has been identified, Subscriber Service Analysis will provide a list of affected subscribers; each of which can be carried into Real-Time Subscriber Insights. With this set of dashboard pages, service providers can view the problem from the perspective of an affected subscriber, including viewing the impact in real-time through Sandvine's LiveView connection.

Figure 6

Sandvine's End-to-End Troubleshooting Workflows

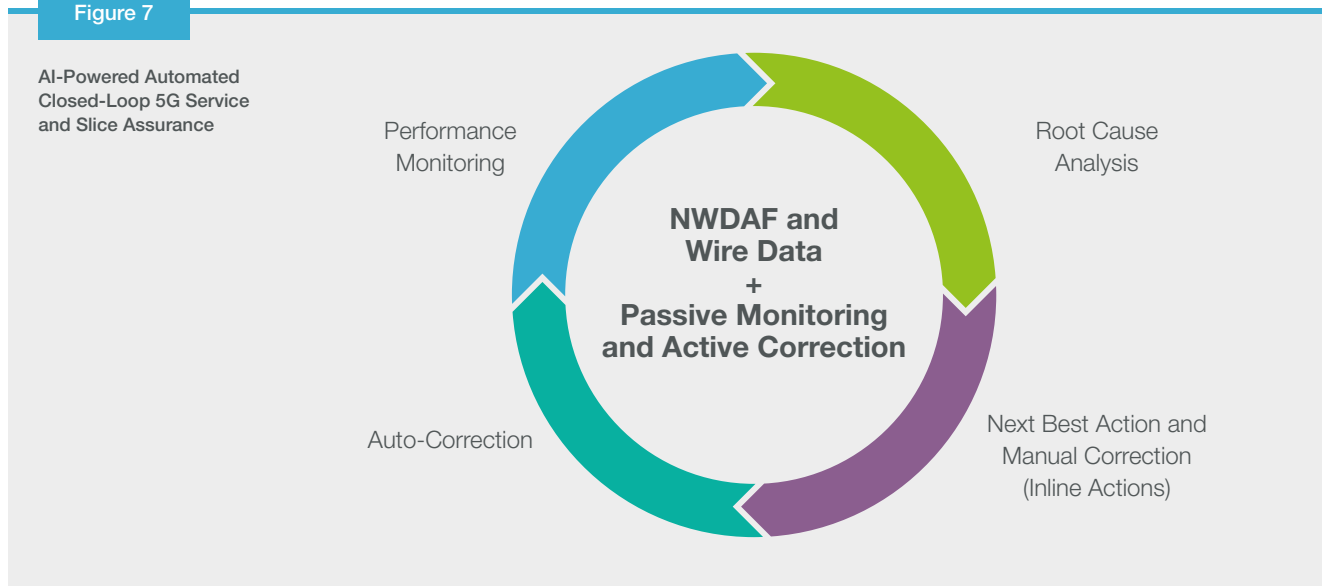| **Performance Monitoring and Analysis**	**Subscriber Service Analysis**	**Real-Time Subscriber Insights**
Network, locations, and applications	Plans, devices, and subscriber groups	Individual Subscribers

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5G Service and Slice Assurance

Ensuring service-level agreements (SLAs) on 5G network slices is a continuous closed-loop process (**Figure 8**) essential to the success of 5G business case. The overarching Service and Slice Assurance Solution from Sandvine includes real-time performance monitoring (KPI and alerts), intuitive workflows for root cause analysis and policy-driven intelligent correction. This next generation Service and Slice Assurance solution leverages 3GPP-specified Service-Based Architecture (SBA), heterogeneous data sources for data collection, machine learning-enabled analytics and domain-specific network automation. Sandvine's Performance Monitoring and Analysis plays a key role in this closed-loop process, delivering the performance monitoring part (shown in **Figure 7**) for key areas such as: NF load, slice health, and application QoE monitoring.

Figure 7

AI-Powered Automated Closed-Loop 5G Service and Slice Assurance

Performance Monitoring

Root Cause Analysis

NWDAF and Wire Data
+
Passive Monitoring and Active Correction

Auto-Correction

Next Best Action and Manual Correction (Inline Actions)

Performance Monitoring and Analysis equips service providers, looking to run a more service-centric operations center, with relevant insights on the applications that consumers care about. It allows for easy troubleshooting with near real-time views as well as further analysis to identify problems that occur over longer time intervals. With this use case, service providers can address network issues and improve customer satisfaction and experiencefor the applications users rely on.

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**.

SANDVINE

The App QoE Company

USA	EUROPE	CANADA	ASIA
5800 Granite Parkway	Neptunigatan 1	410 Albert Street,	Arliga Ecoworld,
Suite 170	211 20, Malmö	Suite 201, Waterloo,	Building-1, Ground Floor,
Plano, TX 75024	Skåne	Ontario N2L 3V3,	East Wing Devarabeesanahalli,
USA	Sweden	Canada	Bellandur, Outer Ring Road,
	T. +46 340.48 38 00	T. +1 519.880.2600	Bangalore 560103, India
			T. +91 80677.43333

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