IDC VENDOR SPOTLIGHT

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Application and network intelligence is not a new concept. However, applied to today's evolving networks, this insight gives service providers a better understanding of just what kind of experience their customers have in the day-to-day use of the applications they find most important — social media, productivity, or entertainment.

Application and Network Intelligence Is Critical for 5G Success

November 2021

Written by: Karl Whitelock, Research Vice President, Communications Service Provider Operations and Monetization

Introduction

Digital service providers (Digital SPs) are continuously looking to drive down capex and opex in all parts of their business, especially as 5G implementation plans materialize. But cost reduction is not all that is needed. Accelerating business evolution tied to revenue-rich services involving edge computing and network slicing is set to help establish new revenue streams. By monetizing network and datacenter investments, digital SPs can tailor connectivity to different users and applications, revolutionizing what can be achieved in healthcare, smart cities, gaming, augmented reality/virtual reality (AR/VR), manufacturing, logistics, sports, and energy. With this focus, digital SPs move up the value chain as enablers of ever-widening ecosystems.

AT A GLANCE

- Application and network intelligence is the ability to analyze, optimize, and monetize applications and network connectivity in the delivery of quality customer experiences.
- Customers care about how their application plays across a network connection rather than the connection itself, whether 4G, 5G, 5G/MEC, fixed, or even Wi-Fi.
- Service providers with the means to measure their experience of their customers across the apps they use will be in the driver's seat for managing a positive customer experience. This means increased customer loyalty and revenue.

The challenge is that millions of users and billions of mobile devices each possess their own applications and policies for quality of service (QoS), connectivity, availability, mobility, and performance. Complexity continues to increase when Internet of Things (IoT) devices and multi-access edge computing (MEC) grow to significance as 5G standalone (5G SA) networks take form. To guarantee service levels and gauge network awareness in this evolving environment, networks must be responsive and adaptive to in-app quality of experience (QoE). Understanding the app dependencies within different parts of their networks that affect mobile customers helps digital SPs consistently and reliably meet customer expectations while achieving internal business goals tied to capacity management, operational effectiveness, enhanced service quality, and better QoE.

These challenges and others are driving interest in enriched "application and network intelligence" — the ability to analyze, optimize, and monetize applications and network connectivity in the delivery of quality customer experiences.

Application and network intelligence is a step up from traditional network monitoring and assurance. It moves organizations toward more customer-centric service assurance by helping them understand and act upon the quality of

data delivery across the network at both a service level and a customer level. Insight about how customers perceive application QoE, and the ability to act on it, is central to the larger customer experience management process.

QoE has always been important in the broadband services market, but with the adoption of 4G technology and now the emergence of 5G technology, the customer's experience has come into full focus as a strategic driver of service satisfaction for fixed wireless access (FWA) and mobile services, together with wireline-based broadband services. For some digital SPs, the next level of insight analysis is already taking shape.

Why Is Application and Network Intelligence Important Now?

For the full customer experience picture to be clear, understanding just the network connectivity underpinnings, though very important, is not enough. Service providers need a solid perspective concerning the "usefulness of the usage experience" each time customers engage with applications that generate the data carried across the network. This level of understanding plays a large role in how customers perceive the value called out via Net Promoter Score (NPS) ratings. For example, was today's social media experience, which included voice conversation and video messaging, discernable in this part of the network at this time of the day? Could everyone hear and see me OK at the Zoom video work session with our customer? Can I prioritize my work productivity and video conference apps for my home office so that I receive top bandwidth priority between 9:00 a.m. and 5:00 p.m.? Which of my apps are using the most bandwidth, and how can I dynamically allocate network capacity between apps running at my location whenever necessary?

As we move past the first-year impacts of the global pandemic and facilitate work/life balance, where working from anywhere is an ongoing reality, digital SPs need to view the degree of capability that the network plays in an NPS-driven approach to business. They must also see how the different types of app data traversing their networks relate to customer usage and to whatever actions are necessary for satisfying service quality parameters on a real-time basis. This advanced measure of customer experience management, known as application and network intelligence, is shaping up to be the most important factor in meeting today's customer expectations.

Customers care about how well their self-created videos look to their highly cultivated social networks and how their content plays on various devices and over different content aggregators, such as YouTube, Facebook, or Twitter. During a recent two-day Facebook blackout, users immediately flocked to TikTok and YouTube rather than tolerate — even temporarily — a disruption to their communication and engagement within their social networks.

Businesses relying on enterprise communications, collaboration, customer relationship management (CRM), cloud, and software-as-a-service (SaaS) solutions care about getting the day-to-day performance they pay for and getting a return on the investments they make for app availability, engagement, and interactive performance. For mission-critical use cases, whether an ambulance sending images to a hospital, smart machines in a factory, or autonomous vehicles speeding down roadways, application and network performance really matters. If expectations are missed, especially on a repeated basis, NPS and brand loyalty suffer.

Application Complexity Is Growing

Individual applications are now expanding into complex mashups of different services and multiplexed services within a single flow. This is leading to intricate mixes of services and apps with embedded combinations of payments, maps, chat, and other features. Adding to the complexity, the lines between people's personal, professional, and educational lives are blurring, making more members of the average household or average business "heavy users" who want high-level performance and seamless experiences across their favorite applications. They want it any time of the day, over any device, in any location, and over any access network.

There is also a complex mix of protocols (i.e., UDP, Quic), security and privacy concerns (i.e., encryption, Apple Private Relay), and ever-growing latency, reliability, and speed demands that fit into the QoE monitoring equation. These factors make once reliable predictors of traffic patterns, customer behaviors, and peak usage somewhat obsolete. The time has come to go beyond solutions that say "video is not performing well" to those that show which individual applications are struggling as well as why they are struggling and then provide the tools that empower key people in the digital SP to act.

This insight will inform different work teams within the digital SP:

- **CTO office.** CTOs who want to drive 5G and cloud growth, multi-network and country strategies, and application QoE across the technology life cycle need predictive insights into where complex applications are headed. These insights could be based on usage trends, where to invest, and how to get the most out of limited capex and opex budgets through better capacity planning.
- **Operations.** Operations teams for whom the "product" of the network is application QoE need greater control over QoE to drive network performance and service personalization (e.g., by application, device, location, and QoS). They also want to know about outages, cyberattacks, and breaches; how to quickly address traffic growth or shifts; and the communication and collaboration tools that expose threat vectors against them.
- **Network planning and engineering.** Network planners and big data teams require an application QoE perspective for capacity planning based on adoption, traffic, and application growth trends. By getting crucial key performance indicators (KPIs) and metadata from real-time application traffic, they can look at application profiles in different parts of the network, predict where future problems and congestion will be, and prevent outages. They can also use application and traffic metrics to plan expansions.
- **Market development and customer care.** Market development and customer care leaders need to acquire customers and expand services with existing customers; however, this is difficult in marketplaces flooded with agile, digital-native, and cloud-based competitors. They need help addressing the challenges of growing revenue and reducing customer churn. They want insight about different types of customers, applications, device usage, locations, and behaviors to better develop and market relevant and meaningful offers using these parameters. They also know this information helps resolve problems faster.

For these digital SP work teams, and likely others, application and network intelligence bring many benefits, including:

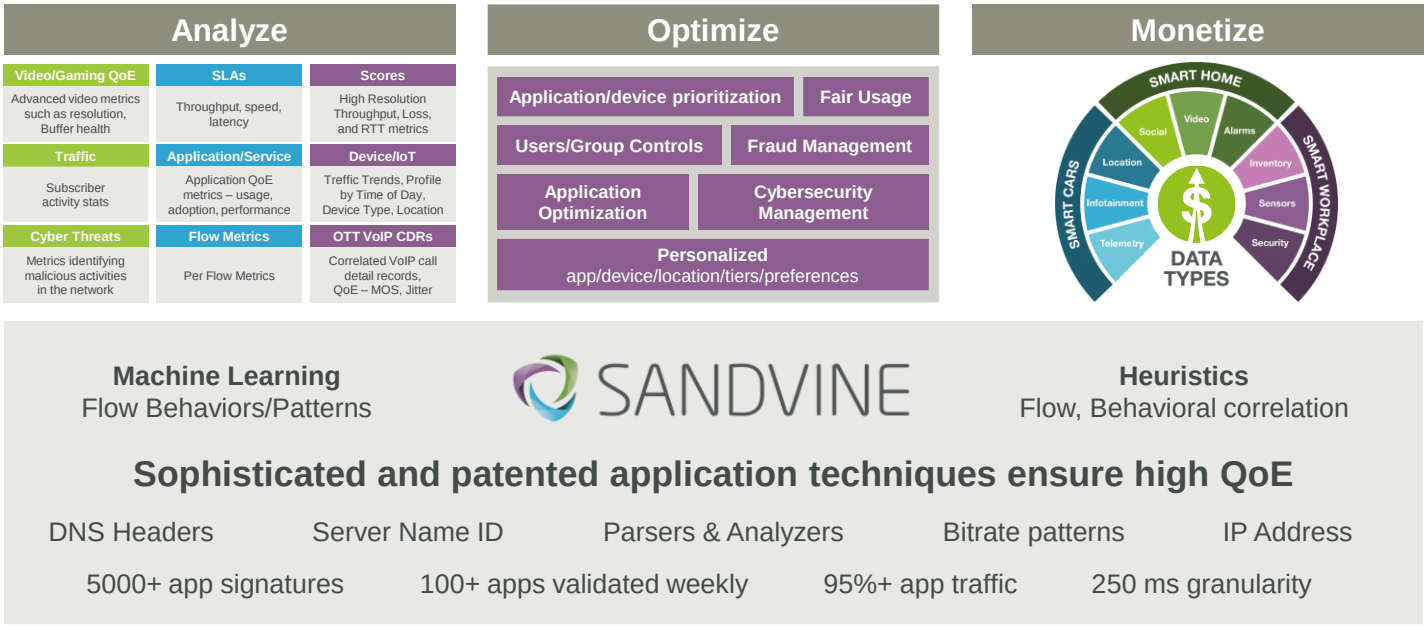
- Enhanced service-level personalization and loyalty
- High-quality application and network experience in the 5G era
- Customer-driven prioritization of applications and devices within the customer's environment
- A means for minimizing application-based congestion
- Customer-level performance reporting
- Revenue growth spurred by application-, device-, and usage-based plans

Ensuring an effective customer experience over any network at any time is more important now than ever before, and it depends on how well applications deliver on what customers want from their entertainment production apps, productivity tools, social media, retailer portals, and industrial apps.

The Sandvine Application and Network Intelligence Solution Suite

Sandvine points out that its solutions are deployed with 500+ customers worldwide, including communications companies such as NTT, Telefonica, KDDI, SK Broadband, Comcast, and Viasat. Sandvine has evolved from deep packet inspection and active network insight to a higher level of application and network intelligence designed to bring granular classification to more than 95% of all network traffic at intervals of 250 milliseconds or less. Sandvine offers solution capabilities as modules within what the company calls its Analyze, Optimize, and Monetize functional domains (see Figure 1).

FIGURE 1: ***Sandvine Application and Network Intelligence Solution Suite***



Source: Sandvine, 2021

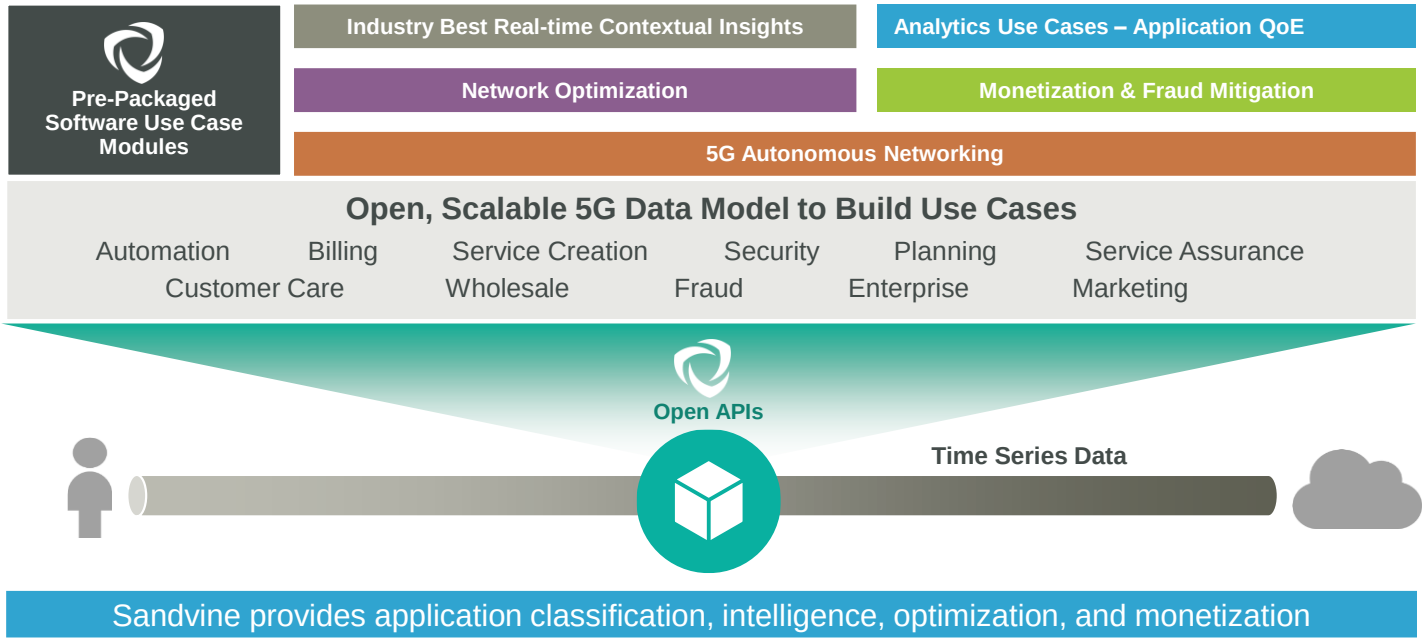
Sandvine states that using machine learning (ML) and user-plane analytics, it can identify macro trends across millions of subscribers, thousands of applications, and billions of devices. The company's use case modules are designed to reveal what is going on with nearly all network traffic by tapping a database of 5,000+ application signatures and ML-based algorithms. Results enable digital SPs to deliver high-quality application experiences to their consumer and enterprise customers by taking inline actions such as prioritizing applications and devices, ensuring fair usage, managing cyberthreats, and growing revenues through application and usage-based plans. The Sandvine solution suite is offered as prepackaged use cases that target the different digital SP work teams described previously, including:

- **CTO office.** Performance and application QoE monitoring, real-time subscriber insights, and 5G adoption analysis
- **Operations.** Performance and operational monitoring, real-time subscriber insights, video QoE analysis, congestion management, cyberthreat management, and slice load analysis
- **Network planning and engineering.** Capacity planning, network performance analysis, slice load analysis, NF load analysis, and 5G adoption analysis

- **Big data.** User behavior and demographics, service and subscriber analysis, video QoE analysis, and cyberthreat management
- **Market development and customer care.** Zero-rating and application-based plans, usage-based services, and service and subscriber analysis

With a focus on ML classification techniques, the Sandvine Application and Network Intelligence solution suite is designed to dissect traffic by any parameter the user specifies, including network type, network slice, location, user, application, and device. This granular level of detail conveys application and network health as well as customer satisfaction or dissatisfaction. Reporting details are made available through a menu-driven user interface. Insights can be exported to any system via open application programming interfaces (see Figure 2).

FIGURE 2: ***Sandvine Application and Network Intelligence Data Model and Use Cases***



Source: Sandvine, 2021

Sandvine states that it is focused on cloud-native 5G innovation, transition, and automation. It accomplishes this purpose by providing automated QoE insight with real-time data from customer application usage. Real-time insight is the foundation for understanding customer sentiment, which is heavily influenced by the network, CRM, billing/charging, pricing, and customer trouble reporting touch points.

The Sandvine 5G Service Intelligence Engine, a Network Data Analytics Function (NWDAF), is central to the company's ML-driven analytics use cases, giving insight into service experience per slice, per user, and per application. As a 3GPP standards-compliant and cloud-native solution, the NWDAF automates 5G insight analysis through machine learning, incorporating standard interfaces from service-based architecture. Sandvine is an active contributor to the 3GPP's NWDAF standards development, helping the company enrich its solution with traffic classification capabilities and granular KPIs that help digital SPs manage their networks as they transition to 5G. An example use case would be sending KPIs to a policy control function to decide about security on a noisy node or to determine if QoE is unequal across subscribers in a cell.

Insights provided by the Sandvine Application and Network Intelligence solution suite can further help customers with their decisions about 5G device performance compared with that of 4G; subscriber experience in 4G and 5G networks; service continuity and experience assurance for "in session" connectivity as a mobile signal transitions between 5G SA and 4G/5G non-standalone (NSA) networks; FWA deployment penetration and performance analysis; and application performance optimization such as video or gaming.

Sandvine's integrated data analytics framework is designed to support data exports and persona-driven dashboards, which communicate with key systems for a window into how each application is performing to troubleshoot poor application QoE, resolve customer issues, and improve application experiences. To make insights actionable, the framework provides purpose-built user interface workflows and tools for accessing and customizing data visualization. According to Sandvine, it provides a comprehensive visualization workflow library and support for rapid custom reporting.

Industry and Experience Management Challenges

As the 5G era dawns, expectations increase relative to application and network performance. Digital SPs need the flexibility to rapidly address changing business conditions. This includes proactively detecting service-affecting issues and understanding what applications are important to customers based on usage and time-based parameters. Central to the customer experience are several challenges that can no longer be paid lip service if performance-based pricing models are to be successful and the full degree of 5G enabled business opportunity is to be realized. These challenges apply not only to application performance and network behavior but also to digital SP business focus and the degree to which the solution supplier community gives attention to the problems at hand. Some of the more significant industry challenges are:

Central to the customer experience are several challenges that can no longer be paid lip service if performance-based pricing models are to be successful and the full degree of 5G-enabled business opportunity is to be realized.

- **End-to-end service-level complexity in the 5G era.** Regardless of the 5G SA delivery cycle, digital SP networks will involve 4G and 5G technology combined with fixed line infrastructure to satisfy customer objectives. In addition, MEC-based edge capabilities will involve layers of partner inputs. Such dynamic hybrid service offerings create an environment where uber levels of operational complexity are present within all operations and monetization workflows. Additionally, the risk that complex network handoffs will affect customer service quality is elevated in this environment. Thus, continuous monitoring is required to verify that the level of service quality is at least meeting and regularly exceeding customer expectations.
- **Digital SP understanding of the issues around identifying network traffic.** Complex network traffic and application usage analysis is a staple within the communications industry for the foreseeable future. However, not every network problem can be solved with a single approach. The dynamic and real-time nature of 5G operations makes the traffic identification process much harder, but flying blind with no insight is a guaranteed recipe for delivering service capabilities that no longer meet customer expectations.
- **5G network slicing performance.** Network slices need to be monitored for overall resource usage and to address the expansion or contraction of network connectivity as needed to satisfy various and concurrent service demands across a digital SP's network. Additional concerns prevail as some customer services will incorporate multiple slices to deliver expected customer value. Slice performance and usage monitoring data can be shared with other operations and monetization systems to maintain network operations levels, but customer application usage needs

to be measured and included with all advanced network insights and resource usage demands. Slice management will need to be based on both network connectivity behavior and application performance insight. However, several questions remain unaddressed at this time as slicing waits to become a full service 5G reality.

- **Solution supplier market presence and availability.** Sandvine is a prime example of a solution supplier that is working diligently to correlate network and application usage into meaningful insight about the customer experience. However, one organization cannot meet these needs alone for all service providers globally. But how many other companies can address global traffic monitoring concerns to this level of granularity without significant attention to both the network construct and the application usage environment?
- **Customer-level allocation and control of network performance.** Customer-focused application usage is increasing and so is encryption. Providing levels of control is essential for long-term network operations and for helping customers to "dial in" to the right combinations of tunable parameters (low latency, high throughput, and speed). With the advent of 5G and MEC working in tandem, along with placing key operations and monetization functions at the edge in multiple locations, significant levels of coordinated interaction are required to satisfy business and network performance needs. This is not an easy task for even the most dedicated business analysis solutions.
- **Lack of skilled services resources.** As the needs for 5G operations and monetization management unfold, the topmost requirement of digital SPs globally is for any new system development to be cloud native as containerized microservices. While cloud-native software development is not new for the general IT development community spanning multiple industries, it is still very new for the communications industry. Digital SPs repeatedly state that they need help from trusted partners in receiving, installing, and configuring cloud-native software applications pertaining to the customer care, customer experience, order management, provisioning, assurance, and charging/billing processes. In many cases, a lack of skilled resources extends project implementations with some digital SPs, but when resources are available, they deliver new capabilities much faster than previous waterfall development methods. In like manner, analytics is new to the communications industry, and skilled resources involving the specific systems necessary for understanding data correlations tied to customer experience management are also in short supply.

For too long, the global telecommunications industry focused on the level of quality each network provides as well as its associated secure reliability and 5-9s availability. These attributes have defined the industry for over 100 years, yet attention has been focused on the customer, particularly the customer experience, only for the past 10–12 years. Application and network intelligence is the key that will unlock some of the mystery pertaining to a quality-based customer experience by providing digital SPs with the capabilities to understand what their customers really need to maintain acceptable service performance.

Conclusion

In today's world, customers are less concerned about whether their mobile device uses a 3G, 4G, or 5G network connection or even Wi-Fi for that matter. They just want their applications to work as expected via a reliable and always available connection. Digital SPs are squarely in charge of addressing this customer experience reality. These connectivity suppliers need solutions such as those provided by Sandvine to deliver actionable insight at the right times and in the proper context to maintain high-quality application experiences for their customers.

About the Analyst

Karl Whitelock, *Research Vice President, Communications Service Provider Operations and Monetization*

Karl Whitelock leads IDC's Communications Service Provider Operations and Monetization global practice. He offers strategic insight and global perspectives concerning service operations and monetization functions, formerly known as OSS/BSS. Areas covered include rating and charging, policy management, partner management, customer experience, revenue assurance and fraud management, service assurance, network data intelligence, service orchestration, and network operations.

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About Sandvine

The Sandvine Application and Network Intelligence portfolio helps customers deliver high quality experiences to consumers and enterprises. Customers use our cloud-based solutions to analyze, optimize, and monetize application experiences using contextual machine learning and real-time actions to improve performance and enhance digital services. Classification of more than 95% of traffic across mobile and fixed networks by user, application, device, and location creates rich, real-time data that enhances interactions between users and applications. These actions improve the customer experience and drives revenue for our customers. For more visit: **http://www.sandvine.com** or follow Sandvine on **Twitter @Sandvine**.

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IDC Research, Inc.
140 Kendrick Street
Building B
Needham, MA 02494, USA
T 508.872.8200
F 508.935.4015
Twitter @IDC
idc-insights-community.com
www.idc.com