Independent market research and competitive analysis of next-generation business and technology solutions for service providers and vendors

HEAVY READING
WHITE PAPER

Overcoming the 5G Challenges of Monitoring, Assurance, and Automation

A Heavy Reading white paper produced for NETSCOUT

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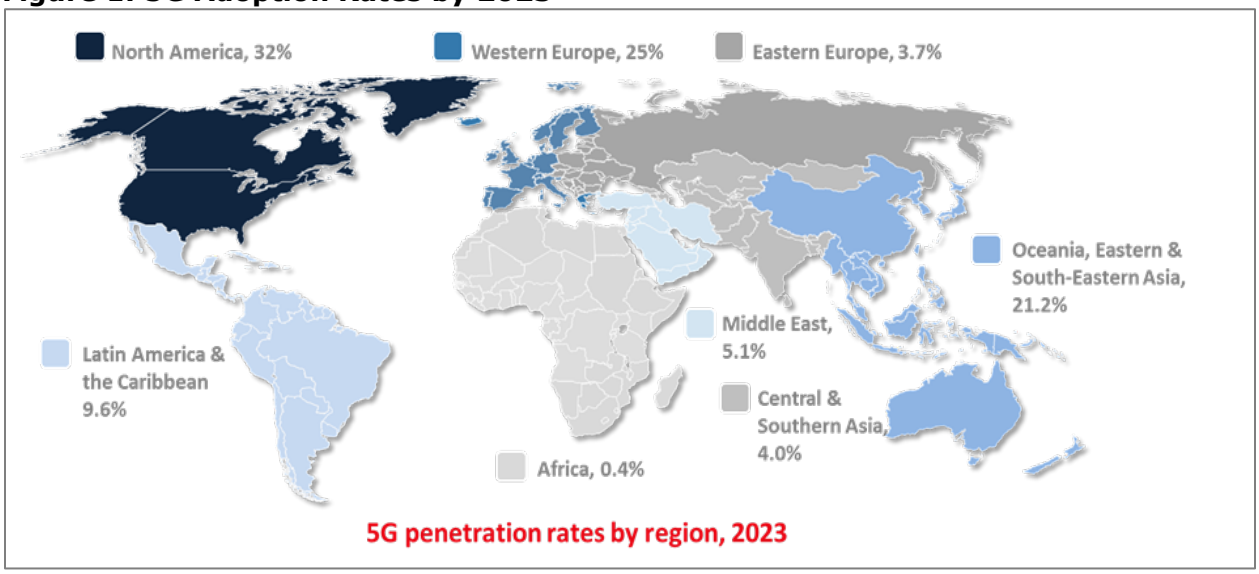
AUTHOR: JAMES CRAWSHAW, SENIOR ANALYST, HEAVY READING

INTRODUCTION

5G is expected to bring a wealth of new opportunities to the telecom sector. These opportunities will be associated with low latency, faster data speeds, and the ability to cost-effectively connect many Internet of Things (IoT)-type devices. Globally, 5G should start taking off in earnest by 2020. By 2023, 5G is forecast to account for nearly 15% of global subscriptions (excluding IoT), accounting for 1.31 billion subscribers, according to Ovum estimates (see **Figure 1**). China, South Korea, and Japan, as well as North America, are leading the 5G race; Europe follows close behind, while the Middle East, Latin America, and Africa are lagging for now.

Figure 1: 5G Adoption Rates by 2023



Source: Ovum

Initial 5G use cases will be traditional connectivity services, primarily enhanced mobile broadband (eMBB), which will deliver gigabit speeds to residential and enterprise customers and could even be a viable alternative to fixed-line residential broadband. To deliver on the promise of eMBB, the mobile core must be highly scalable. As new architectures evolve and operators migrate to a 5G core, they will benefit from new capabilities like ultra-reliable low latency communications (URLLC) and massive machine-type communications (mMTC).

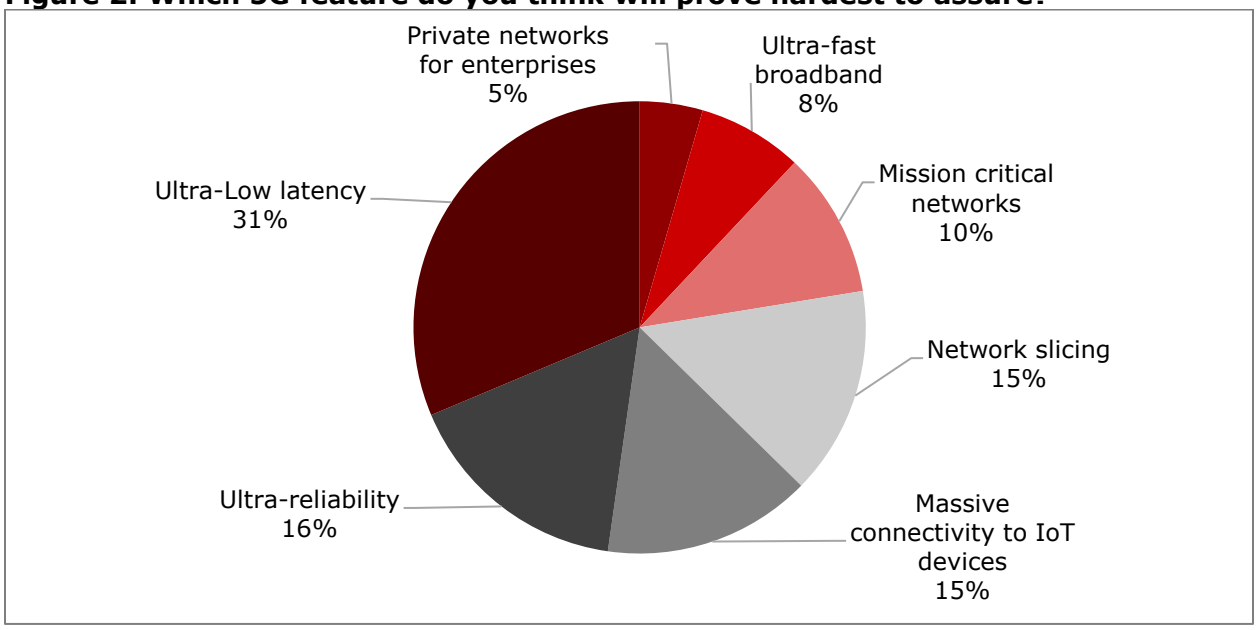
While the use cases for 5G are compelling, implementing such a groundbreaking technology presents challenges. Mobile operators need to provide network engineering and operations with the tools they need to manage the implementation to ensure 5G is a success. This Heavy Reading paper examines the key assurance challenges operators anticipate for 5G, the monitoring capabilities they will need, and their top priorities for the automation of service assurance.

KEY 5G ASSURANCE CHALLENGES

One of the advantages of 5G over previous cellular technologies is a reduction in radio access networks (RANs) and over-the-air modem latency. Delivering near instantaneous communications for applications like autonomous/connected cars, augmented reality (AR)/virtual reality (VR), and robotics poses a significant challenge, especially for mission-critical applications that demand low latency 24 hours a day. A recent Heavy Reading communications service provider (CSP) survey found that the single toughest 5G feature to assure is expected to be ultra-low latency. As shown in **Figure 2**, low latency scored almost twice as highly as the next most popular response, ultra-reliability. Massive connectivity to IoT devices and network slicing were the next most popular answers.

Supporting demanding applications, such as URLLC and mMTC, poses a significant technical challenge for 5G operators. 5G capabilities like ultra-low latency, ultra-reliability, massive connectivity for the IoT, and network slicing will place new demands on operations teams to ensure continuous availability, rapid scalability, and high levels of automation. Real-time communications services will likely be accompanied by service-level agreements (SLAs) that will need high levels of visibility for monitoring, enforcement, and reporting.

Figure 2: Which 5G feature do you think will prove hardest to assure?



N=67
Source: Heavy Reading Survey, May 2019

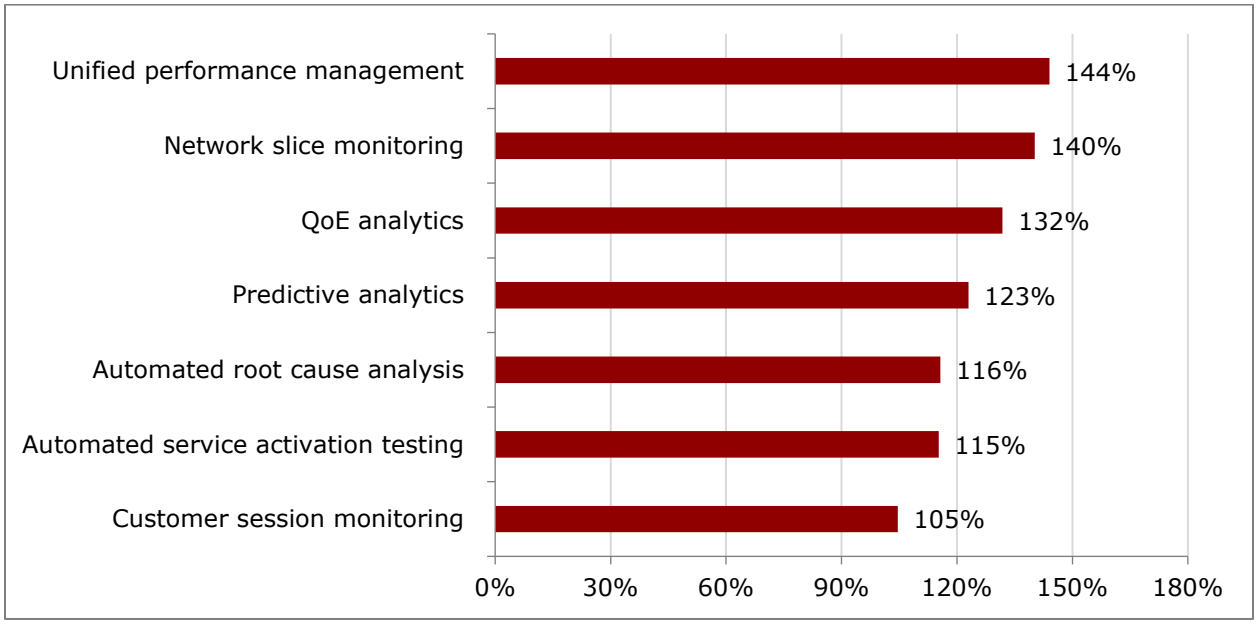
KEY 5G NETWORK MONITORING CAPABILITIES

To ensure the optimal running of 5G networks, the monitoring system will need multiple capabilities. A recent Heavy Reading survey found that the most important capability that CSPs identified was unified performance management, followed by network slice monitoring, as shown in **Figure 3**.

Unified performance management reflects the need for holistic monitoring of a hybrid network composed of 3G/4G/5G physical, traditional, network functions virtualization (NFV), and cloud infrastructure. The importance of network slice monitoring reflects the challenge of assuring that virtual resources that are spun up for specific applications or customers will meet the requisite service levels.

Network slicing creates a new paradigm for the wireless network where network resources can be partitioned logically for individual customers or applications. Network slicing is not new, but it has been greatly expanded in 5G with new slicing features that allow for innovative service offerings. 4G slicing can be partially implemented by network-sharing technology, but with limitations. 5G will allow complete end-to-end (E2E) slicing to serve multiple business purposes. Monitoring traffic characteristics and performance (e.g., data rate, packet drop, and latency), the end user's geographical distribution, per session/user/slice instance-based monitoring, and more will be key to the success of network slicing.

Figure 3: How important are the following network monitoring capabilities for 5G networks?



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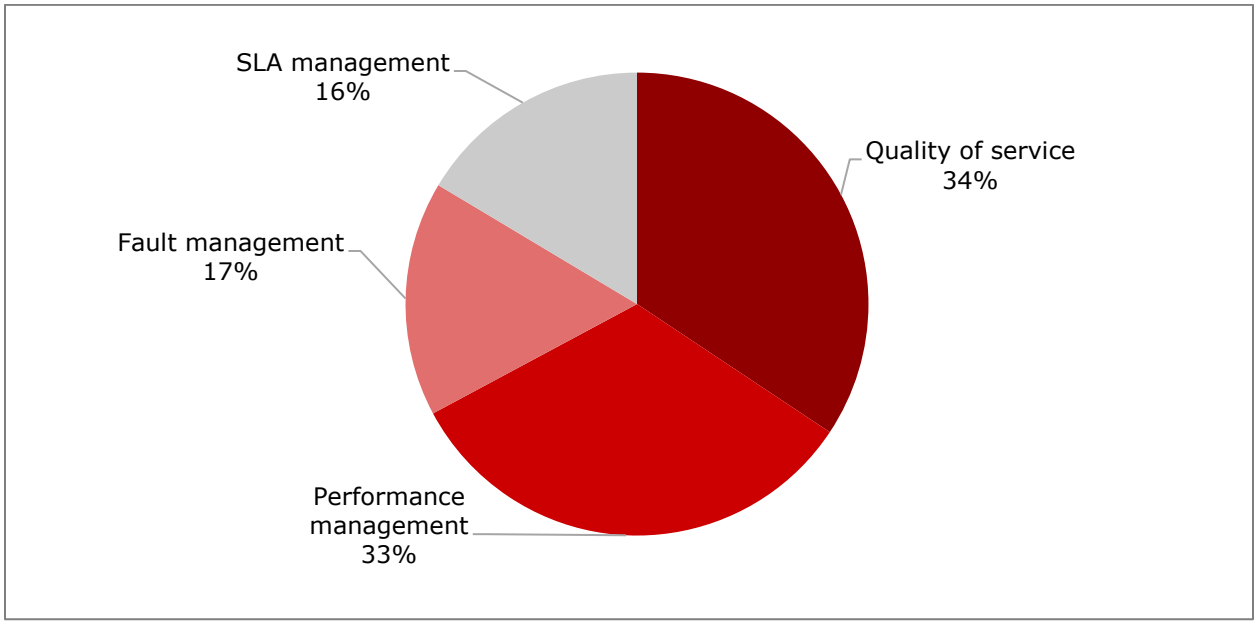
Heavy Reading asked respondents to rate factors as "extremely important," "important," "somewhat important," or "not important." We turned the responses into a single metric for display by applying this formula: [2x Extreme %] + [1x Important %] – [2x Unimportant %].
Source: Heavy Reading Survey, May 2019

TOP PRIORITIES FOR 5G SERVICE ASSURANCE AUTOMATION

Maintaining quality of service (QoS) and network performance are critical to ensuring the success of 5G. This is reflected in the result of a Heavy Reading CSP survey question that asked about the top priorities for 5G service assurance automation. The responses, shown below in **Figure 4**, indicate that QoS and performance management are the top priorities, followed by fault and SLA management.

Next-generation mobile technologies are greeted by the media with much fanfare and anticipation. A mobile operator's brand depends on a successful rollout, as well as limiting any churn that may come from competition promoting their new 5G networks with offers to switch service. Ensuring QoS is paramount to delivering on the promise of 5G's potential.

Figure 4: Which is your organization's top priority for automation in its 5G service assurance?



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Source: Heavy Reading Survey, May 2019

A 5G network brings a new radio and a new core. It includes a new transport network architecture and new technologies, such as network slicing and mobile access edge computing, which increase network complexity and introduce new challenges for operations. The traditional approach of bolting on manual workflows will not be economical.

Assurance activities have historically been very manual, reactive, and time-consuming. Examples include service turn-up and activation, change management, and service quality monitoring and fault isolation. These are prime candidates for the introduction of more automated processes. Automating these workflows can represent a quick win for operations. Automated active testing and service assurance can deliver immediate benefits for existing hardware-based 4G networks and help prepare for the operation of new virtualized and cloud-native 5G networks.

CONCLUSIONS

The telecom industry is in the midst of a massive transformation today. There are three main aspects to this transformation. First, it is about improving customer satisfaction by meeting or exceeding expectations for service delivery and problem resolution. Second, it is about new service offerings enabled by new technologies, such as 5G and edge computing. Third, it is about improving cost efficiency by increasing the level of automation and simplifying the processes used to operate networks.

The networking domain has some particular transformation challenges. First, there is a massive increase in the volume and complexity of traffic being carried. Networks that were built to carry voice are now being used primarily to deliver video. Second, operators must grapple with multiple technology architectures. They have their legacy telco infrastructure, new software-defined networks, and cloud computing. They have multiple radio access technologies running in parallel; while some early adopters may be clamoring for 5G, other IoT type services might depend on 2G connectivity. At the same time, operators must deal with varied and severe security threats. In many cases, the operator must act as the first line of defense for both enterprise and consumer customers. Finally, operators need to increase the level of automation of their operations to reduce the cost to serve and remain competitive against new entrants.

5G is the latest generation of mobile network technology, and it is expected to be a game changer. New techniques in virtualization and softwarization are expected to revolutionize the radio and core network, enabling high performance, low latency, and the flexibility to provide new, on-demand services that meet strict QoS requirements.

A key part of the 5G revolution is the level of automation that can be achieved. And given the ongoing pressure to reduce headcount in the telecom business, that automation is a necessity. Enabling this requires making the radio and core network more dynamic than the fixed and static architectures of the past. Automation will also depend on artificial intelligence (AI) and predictive analytics.

In modern mobile networks, engineers are already overwhelmed by a data tsunami, and this is only going to worsen as 5G is deployed. New tools will be needed to automatically analyze performance data, configuration parameters, and alarm data so that engineers can detect and fix network anomalies. These new tools will give engineers a much deeper insight into the intrinsic problems that may cause network service issues, enabling them to take proactive measures to prevent these problems from affecting QoS.

The biggest challenge for the launch of 5G will be its ability to support demanding applications (eMBB, mMTC, URLLC) and deliver guaranteed latency for mission-critical applications. In order to overcome these challenges, operators are likely to need new tools for network visibility and monitoring.

According to Heavy Reading service provider surveys, unified performance management and network slice monitoring are the most important network monitoring capabilities. QoS and performance management are the top priorities for the automation of 5G service assurance. Ultra-low latency is seen as the toughest 5G feature to assure, followed by ultra-reliability and massive connectivity.

5G brings enriched functionality, but more network complexity. As a result, the amount of data being generated is set to go beyond the capacity of manual design, planning, and management. Network management automation will need advanced data analytics to generate intelligence that can fix and even preempt network errors. The dynamic nature of multi-radio access networks and virtualized cores will make it difficult to trace the root cause of issues. Hence, performance monitoring and analysis will be key to mobile network automation.

ABOUT NETSCOUT

This section is written by NETSCOUT.

For Network Operations and Engineering personnel who are tasked with its operation, the 5G network will be unlike any network before. There are new radios, Cloud RAN (C-RAN), control messaging running over 4G and user plane running over 5G (Options 3/a/x), the expected introduction of containers for multi-access edge computing (MEC) and network slicing, orchestration/automation, and a plethora of new IoT devices services coming onto it.

For communications service providers (CSPs) to successfully roll out this next generation mobile network they must have complete visibility to this new infrastructure. Having the visibility baked into 5G plans now avoids problems later for Engineering and Operations to monitor, run analytics and ensure security of the network.

For 5G deployments, NETSCOUT's monitoring solution for virtualization service assurance, vSTREAM, is designed for the cloud and provides end-to-end visibility for any cloud, network, and workload; including Cloud, Virtual RAN, Virtual Core, and Edge Computing throughout the 5G life cycle.

vSTREAM can assist CSPs at any stage in their hybrid journey to NFV with complete visibility of applications and services deployed in either private or public clouds. vSTREAM is a scalable, software instrumentation product optimized for NFV/SDN/Cloud infrastructure to provide visibility down to the VNF layer with packet forwarding and smart data creation for service assurance, business analytics and security assurance. Together, vSTREAM and the nGeniusONE service assurance application provide a proactive monitoring and service triage solution.

NETSCOUT is the only service assurance provider with a comprehensive solution for monitoring end-to-end for the hybrid journey with:

1. **Unparalleled visibility into virtualized infrastructure**

   NETSCOUT's service assurance solution offers seamless visibility to hybrid networks so that Operations and Engineering can monitor the entire network, both legacy and virtualized infrastructure in one console with nGeniusONE.

2. **Integration with orchestration and automation**

   NETSCOUT's solution is already proven to integrate with policy control engines with a real-time feed of our smart data in a closed feedback loop to support orchestration in virtual infrastructure.

2. **Lowest total cost of ownership**

   vSTREAM is optimized for software implementations providing the greatest scalability at the lowest cost (in terms of utilized cloud compute resources). vSTREAM provides visibility down to the VNF layer and can bypasses the vSWITCH for greater performance and cost savings.

Having the service and security assurance in place for new technologies such as 5G and NFV will enable Network Operations and Engineering to deliver new services and improving service performance as well as trying to reduce operating costs. For more information go to www.netscout.com.