

AKAMAI WHITE PAPER

Measuring Real Customer Experiences over Mobile Networks

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Executive Summary

Mobile network operators (MNOs) face many new challenges and opportunities as they turn their focus to data-driven usage. Customers expect a great deal from their mobile service providers and mobile devices, including instant access to mobile websites, apps, and media services at their fingertips. Meanwhile, advancements in technology and the importance of the mobile customer have mobile websites and applications loaded with dynamic and video-rich content to maximize each mobile experience. This puts pressure on the performance of the mobile network, because it is the MNOs that are typically blamed for any shortcomings in the mobile experience. This is the case even if the cause is not related to the quality of service (QoS) metrics they traditionally monitor and measure.

According to 451 Research¹, 71% of mobile consumers who download Internet content hold their service provider responsible for their quality of experience (QoE). Customer experience (CX) management is predicated on QoE, and measuring data from the perspective of the end user can help MNOs better understand and manage the user experience. MNOs need better insights into the real experiences they're delivering to subscribers. They also require the ability to measure the QoE being delivered to subscribers, and most would welcome the opportunity to understand the performance of other mobile networks to gain insights into how they're performing versus the competition. In fact, QoE KPIs are becoming so important that many MNO executive bonuses are being impacted by the results of CX management measurements.

Today, MNOs are primarily relying on metrics from drive testing and crowdsourcing applications to try to gain perspectives on mobile user experiences, but these approaches each have advantages and disadvantages that need to be considered. This paper reviews the pros and cons of each of these methods. It also introduces an alternative approach to measuring real-world QoE using Content Delivery Network (CDN) analytics to capture more accurate and timely metrics of web and media interactions from real end-users to help MNOs understand the quality of the customer experience they are delivering.

Challenges in Measuring Actual Customer Experiences

All MNOs want to provide subscribers with the best customer experience possible, but measuring mobile experiences has been an ongoing challenge. According to Ovum, 24% of subscribers surveyed stated their intention to leave their mobile operator in the next 12 months. Improving subscriber satisfaction is crucial to growing revenues and increasing retention rates, but the lack of common KPIs for evaluating QoE has provided MNOs with limited opportunities to objectively evaluate the actual performance levels of their mobile services.

In a saturated market where penetration has exceeded 100%, the best way to differentiate mobile services is to offer the best service. Subscribers can easily change service provider, so MNOs must remain competitive based on both subscriber satisfaction and price. Having the ability to benchmark network performance against both historical trends and the competition, as measured on the mobile devices of subscribers, can provide insights important to network planning and retention activities. CX management benefits significantly from monitoring and measuring individual subscriber sessions and events. To provide the level of quality users expect, MNOs need to gain a more granular understanding of the mobile user experience based on the:

- Type of content delivered
- Subscriber location
- Subscriber device
- Network conditions

Traditional network analysis products measure network characteristics that impact QoS performance information, such as jitter, packet loss, and throughput, but do not take into account the actual experience as perceived by subscribers. Mapping those network events to an actual application session—such as a subscriber watching a streamed video—is tricky with conventional measurement solutions, and it leads to inaccuracies. For example, a streaming video is comprised of specific packets on the network, and while network monitoring may have no measurable loss or latency, subscribers may still experience slow playback or buffering that has a negative impact on their viewing experience.

Mobile subscribers do not think of their video or Internet browsing experience in network-focused terms such as packet loss and throughput, but rather consider how long it takes before content is downloaded or how fast it takes to reliably start a video. QoE KPIs are the strongest way to measure subscriber satisfaction. A lack of QoE data points has resulted in the reliance on network-centric measurement of QoS metrics like throughput and latency at the expense of application-centric metrics like page load time, playback time, and rebuffering delays. This inevitably leads to false conclusions for CX. It also leads to breakdowns between MNO marketing and network operations teams over how well the MNO is—or isn't—meeting subscriber expectations.

Traditional QoE measurement tactics only capture a moment in time when measurements were taken, providing limited abilities for MNOs to identify QoE trends and accurately evaluate results over time. Monitoring using third-party drive testing is based on small sample sizes and does not provide continuous views of QoE from the perspective of a mobile subscriber. There is also a lack of a universal metric for QoE today, and MNOs do not have the ability to evaluate the real customer experience across networks to gain visibility into their performance levels compared to user perceptions of the performance levels of competitors.

Evaluating Alternative Methodologies

Considering the pros and cons as well as the best use cases of each method allows MNOs to select the right approach—or approaches—for them to measure CX.

Drive Testing

Drive testing is a method of measuring the coverage, capacity, and QoE levels of a mobile network. It is implemented by deploying vehicles containing mobile radio network air interface measurement equipment and various selected mobile handsets that can measure a broad range of physical and virtual parameters of mobile cellular services in a defined geographic region. They utilize proprietary software, so the results are not necessarily the same as they would be if they were measuring actual customer viewing sessions.

By measuring what a subscriber is experiencing in any particular location, MNOs can make changes to their networks to enhance coverage and service levels. Drive testing requires a mobile vehicle outfitted with drive-testing measurement equipment as well as multiple popular mobile devices connected to multiple mobile networks. There are two ways MNOs can leverage drive testing to obtain network performance data:

- Using internal resources
- Hiring specialized drive-testing firms or subscribing to their reports

Drive Testing Performed by MNOs

Relying on internal resources to drive-test service areas gives MNOs greater flexibility for customizing test routes. It also allows MNOs to regulate the frequency of drive tests based on data collection and budget tradeoffs. The primary advantages of performing the tests internally are greater flexibility and control over data collection. The ability to tailor the actual outdoor and indoor locations to be tested and the frequency of the tests allow MNOs to focus resources on problem locations and services. MNOs usually equip test fleets with mobile devices connected to competitor networks to gain valuable performance benchmarks that deliver a better understanding of competitive performance. This approach supports efficient bandwidth capacity management and resource allocation to improve service.

Drive testing using internal resources also has cons, the primary one being that it is extremely costly to outfit the fleet of vehicles and pay dedicated, skilled engineers to survey locations and collect data. It doesn't easily enable trend analysis, since in most scenarios geographic locations are only surveyed a couple times a year. Operators also have a limited-time window for collecting the data.

Drive Testing by Third-Party Companies

Third-party drive testing by specialist companies is far more popular, because it's less expensive than testing with internal staff and it provides MNOs with broader test coverage. It also allows MNOs to utilize objective test data, highlighting performance advantages over competitors to support marketing campaigns aimed at both retaining existing subscribers and attracting new customers. Several established testing companies are available to capture and provide measurement data, but there are limitations to this approach.

Even leading drive-testing companies only offer services in a few countries, leaving most operators without access to third-party validation of their network QoE levels in other countries. There's also a short sampling window, with testing done in a given service area only about two weeks per year. Relying on drive testing by third parties therefore does not allow MNOs to capture valuable trend data. The report data can also be quite old, because it takes time to complete the drive testing and publish the related data. These organizations also conduct limited in-building testing, which greatly limits the validity of the data since it restricts the real-life scenarios we all use to evaluate our mobile operators. MNOs therefore gain no true insight into office and home performance levels and like internal drive testing, the results do not validate real-world usage environments.

Best Use Cases for Drive Testing

Virtually all MNOs leverage drive testing to measure network performance, but it does not provide metrics on application performance or the real customer experience. The primary use case for internal, do-it-yourself drive testing is to customize the coverage, area, and frequency of the tests being conducted to capture unique information that can potentially lead to competitive advantages in the market. It is also used widely to investigate and resolve coverage or service problems by designing specialized tests to drill into known problems and capture the necessary information needed to reallocate resources to improve performance for a particular service or location. Most MNOs subscribe to third-party drive-testing research so they can gain high-level insights into network performance and evaluate service levels versus those provided by competitors. It is also used to identify dead zones that need to be addressed and support geographic expansion of service areas.

Third-Party Crowdsourcing Apps

Another alternative is to tap into the collective intelligence of mobile subscribers to access network performance data collected by providers of crowdsourcing apps. Leveraging the efforts of end users who take the time to test and analyze the performance of their mobile services can provide MNOs with access to network performance information aggregated from mobile devices deployed throughout their service areas. Since many of the tests are conducted in offices, homes, and while users are in transit, MNOs can analyze the data to gain informed perspectives on synthetic testing in real-world locations.

Mobile users just download free apps from online stores and can conduct performance tests from their mobile devices, with information aggregated by the app providers and made available for purchase via periodic reports. The main advantages of this approach are that crowdsourced data is relatively inexpensive, data is segmented by carrier to support competitive analysis, and in-building results can be factored into performance data. The downside of this methodology includes the fact that the value of the data depends entirely on user adoption rates. Crowdsourcing also presents distribution, coverage, and scale testing challenges, which can lead to inconsistency in the quality and availability of the data.

Since crowdsourcing relies on synthetic throughput and ping testing, it does not provide real-application data such as measurement of the experience of viewing videos or participating in social media sessions. Crowdsourcing therefore is not capable of providing application-level reporting, and it is necessarily biased because many of the app users will run the performance tests only when they're already experiencing performance problems. Some MNOs even use the number of times users run a speed test as a potential churn indicator. Crowdsourcing consumes user batteries and data allowance, and the performance data can also become stale, since users are not likely to continuously repeat the tests in the same locations.

Best Use Cases for Crowdsourcing

Crowdsourcing provides continuous network-level information, but it is synthetic rather than application-focused. The information is useful for high-level executive reporting and effective as a means of identifying the locations that are heavily tested. MNOs can consider excessive testing in a location as an indicator of the need for greater buildouts to meet subscriber QoE expectations.

Network Experience Analytics

Mobile users have distinctively unique content requirements and data usage patterns, which make obtaining the data necessary to properly optimize traffic and improve user engagement a time-consuming and difficult process. It requires collecting data directly from mobile devices and correlating it with the characteristics of the content being consumed and the conditions of the cellular network at the time of engagement. While drive testing and third-party crowdsourcing each have their strengths, existing QoE metrics only capture an instant in time, and sample sizes are small. Synthetic monitoring or third-party data does not represent actual everyday mobile subscriber experiences, and there's no standard QoE metric today.

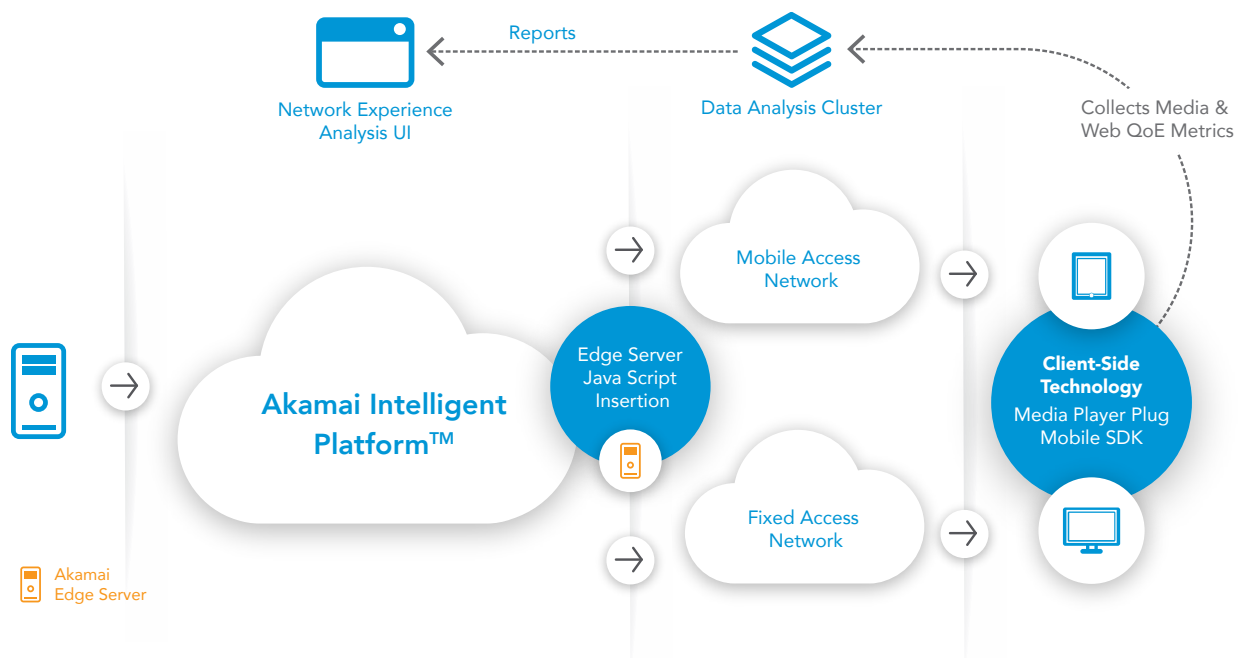


Figure 1: Network Experience Analytics collects media and web QoE metrics end-to-end using CDN infrastructure and analytics capabilities.

Network Experience Analytics is a new way to more accurately measure QoE data at scale. This methodology uses Real User Monitoring (RUM) to measure actual website performance data—such as download and page load time—collected from actual end-user devices and servers. Measuring web performance data combined with media analytics allows mobile network operators to fully understand how websites load and videos play on end-user devices. It leverages cloud services and a CDN to benchmark the performance of mobile networks with a real and accurate view of the mobile subscriber experience. Network Experience Analytics provide:

- Real and actual data to MNOs, with aggregated user-level QoE data for media and web traffic. MNOs therefore can rely on their own QoE data instead of data derived from a secondary data source
- Billions of data points continuously collected 24/7/365 from all networks across hundreds of domains
- End-to-end visibility from the origin server to deliver high-quality metrics
- User engagements that deliver anonymized insights to MNOs on how mobile users are interacting with content

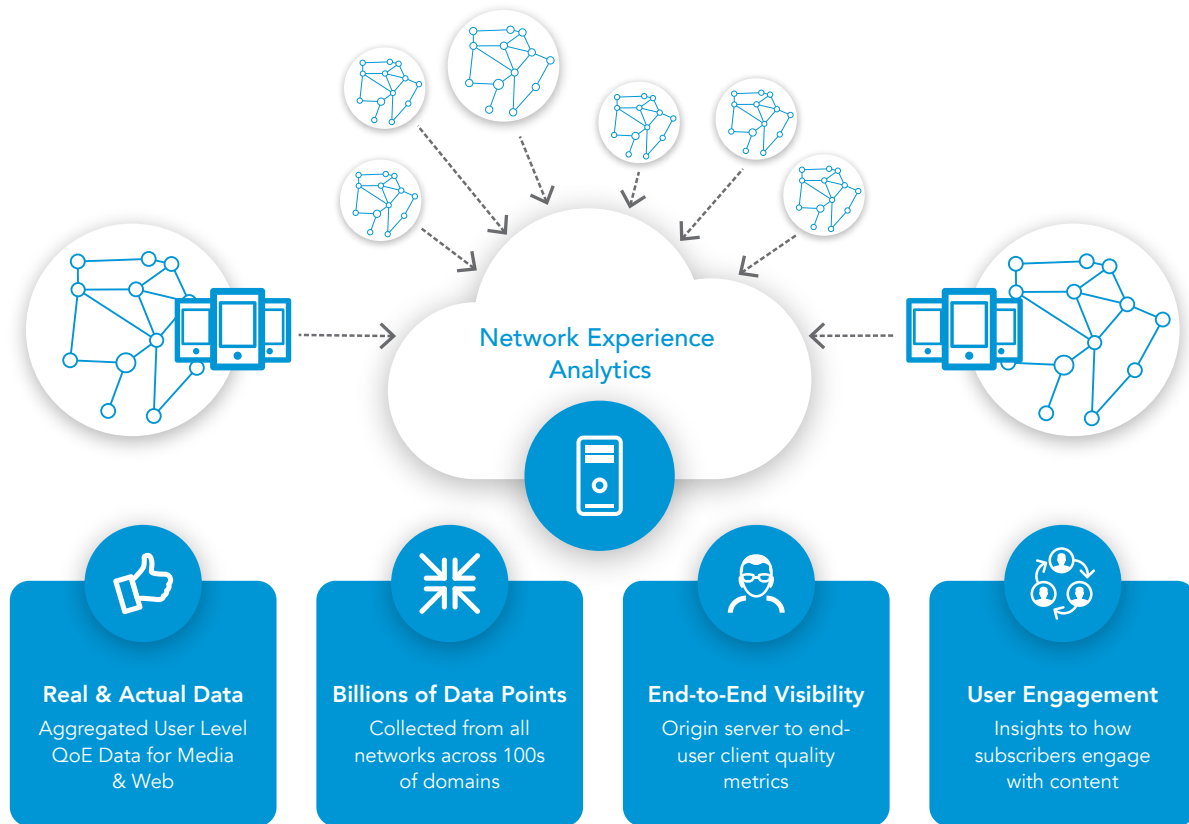


Figure 2: Network Experience Analytics enables a universal QoE metric to drive performance improvements and enable sophisticated competitive analysis.

Network Experience Analytics combine media QoE KPIs with mobile network awareness and capture media and web metrics so MNOs can nurture continuous QoE improvements. It also provides MNOs with a universal QoE score based on human perceptions of video viewing and web browsing over mobile networks. Real world, end-user data across networks provides a framework for competitive benchmarking, and MNOs can continuously leverage actionable data to better meet customer expectations.

Network Experience Analytics provide MNOs with near real-time data and the ability to conduct historical trend analysis so they can continuously monitor and optimize the performance of web and video services. It provides accurate device information and can be integrated with the Policy and Charging Rules Function (PCRF) to provide location information, and MNOs can benefit from Network Experience Analytics without investing in any additional equipment or manpower. It therefore creates tremendous opportunities to cost-effectively and continuously measure real-world experiences and identify and analyze trends.

Best Use Cases for Network Experience Analytics

The best use cases for Network Experience Analytics include MNOs seeking near real-time visibilities or the ability to conduct more accurate performance benchmarking and trending. MNOs can leverage real user-experience data to more accurately and consistently assess subscriber experiences to accurately analyze mobile performance, as subscribers perceive it.

QoE KPI data is collected on all mobile platforms—instead of the few popular mobile devices used in drive testing—providing a rich breadth of data on QoE across the entire spectrum of devices and domains. Unlike drive testing or crowdsourcing methodologies, MNOs do not have to deploy any probing capabilities and can simply subscribe to the analytic data to improve capacity management by measuring QoE throughout the day and during major viewing events, such as political or sporting events.

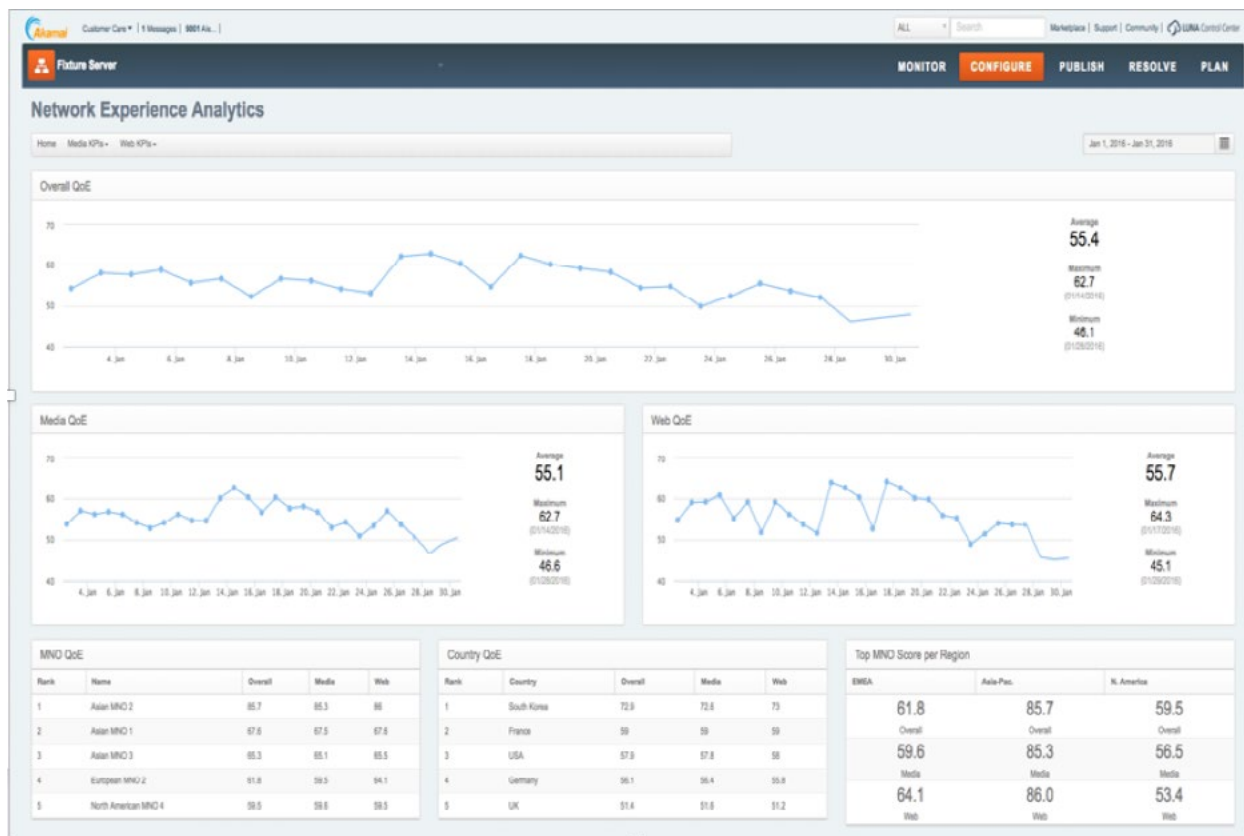


Figure 3: Network Experience Analytics provide drill-down dashboards for measuring end-to-end KPIs.

Conclusions

Measuring the impact of QoE on subscriber churn and customer satisfaction is not a trivial endeavor, but it is vitally important to MNO customer experience management and network teams. MNOs are continually building out their networks to meet the needs of their subscribers, and being able to validate the return on these large investments is extremely important. The use of drive testing and crowdsourcing apps is beneficial for QoE measurement, but more can be accomplished by working with CDNs — whose job it is to understand how the content they deliver to end users performs at the application level.

Network Experience Analytics is a powerful new approach with continuous measurement at the application level across all networks. It provides a consistent measuring methodology that can be used as a common metric for performance across an organization and can show trends and historical QoE trajectories to aid network planning. Network Experience Analytics allow MNOs to gain much greater insights into subscriber experiences so they can tune performance and leverage a universal QoE metric to demonstrate performance advantages and attract new subscribers.

About Akamai

Akamai has more than 200,000 servers in over 110 countries within more than 1,400 networks around the world. Ninety percent of the world's Internet users are within a single network hop of an Akamai CDN server. Akamai is the leading provider of cloud services for delivering, optimizing, and securing online content and business applications and will soon provide a Network Experience Analytics solution that delivers a universal QoE measurement. Akamai delivers 55% of all HTTP interactions on the Internet, and our customers include:

- 98 of the top 200 entertainment customers in the Americas
- 64 of the top 200 entertainment customers in EMEA
- 56 of the top 200 entertainment customers in APJ
- 23 of the top 25 gaming customers worldwide
- 60% of the top grossing iOS & Android game developers
- 49 of the top 100 InfoTech companies worldwide
- 7 of the top 15 social media companies worldwide
- 4 of the top 5 online auction companies
- 13 of the top 15 largest auto manufacturers
- 9 of the top 10 global pharmaceutical companies
- 9 of the top 10 largest newspapers
- 8 of the top 10 online publishers

Akamai offers new and unique approaches to help mobile network operators monetize their network assets, optimize data traffic delivery, and improve the mobile subscriber experience. Our technology helps unify the mobile ecosystem and provides value-added services for both mobile network operators and content providers. For more information, read further about our [Mobile Network Solutions](#).



As the global leader in Content Delivery Network ([CDN](#)) services, Akamai makes the Internet fast, reliable and secure for its customers. The company's advanced web performance, mobile performance, cloud security and media delivery solutions are revolutionizing how businesses optimize consumer, enterprise and entertainment experiences for any device, anywhere. To learn how Akamai solutions and its team of Internet experts are helping businesses move faster forward, please visit www.akamai.com or blogs.akamai.com, and follow @Akamai on [Twitter](#).

Akamai is headquartered in Cambridge, Massachusetts in the United States with operations in more than 57 offices around the world. Our services and renowned customer care are designed to enable businesses to provide an unparalleled Internet experience for their customers worldwide. Addresses, phone numbers, and contact information for all locations are listed on www.akamai.com/locations.