

Ookla response
to
Telecom Regulatory Authority of India
Consultation Paper
on
'Review of
Quality-of-Service Standards
for
Access Services (Wireless and Wireline)
and
Broadband Services (Wireless and Wireline)'



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This document has been specifically prepared in response to the Consultation Paper on 'Review of Quality-of-Service Standards for Access Services (Wireless and Wireline) and Broadband Services (Wireless and Wireline).

The document is submitted on the understanding that the information contained within this document will be treated with the same care and attention that TRAI treats its own confidential and proprietary information.

1. Introduction

Ookla's mission is to measure, understand, and help improve connected experiences and help make the internet better, faster and more accessible for everyone. Ookla appreciates the opportunity to add feedback to this assessment and would be happy to add additional insight or comment in the future if needed.

This document is structured to give the reader relevant background on Ookla to help the reader fully understand the company's objectives, capabilities, and goals in responding to this opportunity. It contains:

- a high level introduction to Ookla
- detailed notes on specific points within the proposed regulations
- direct responses to the relevant consultation questions
- additional items which may be of interest in the annex

At any time, Ookla is open to discussing our test methodologies, practises, and results with a relevant audience.

James Carroll - December 14th 2023

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2. Ookla background and solutions

Founded in 2006, Ookla is part of Ziff Davis (NASDAQ: ZD), a US-based media, internet information and services company.

Ookla is the global leader in mobile and fixed broadband network intelligence, testing applications, and related technologies. The company's flagship platform, Speedtest®, provides invaluable quality of service (QoS) insights into the performance, quality, and accessibility of networks worldwide. These crowdsourced QoS insights are combined with deep RF and lower-layer measurements collected from controlled drive/walk testing plus direct consumer quality of experience (QoE) measurements that show a real-world view of popular activities like video streaming, video conferencing, web browsing, gaming, and more. In addition to crowdsourced data, Ookla is an recognized industry leader in drive testing services with Rootmetrics in both the US and the UK. Together, these complementary datasets provide a holistic view of network performance designed to improve connectivity for all.

Ookla's core mission includes providing unbiased, accurate, transparent, and independent data on the state of the internet to three distinct constituencies: consumers, the telecommunications industry, and governments and industry associations. Ookla data and insights empower consumers to make informed choices by providing them with accurate information on the quality and performance of their internet and wireless connections. The telecommunication industry relies on Ookla's benchmarking analytics to optimize and improve their networks and better position their services to consumers. The industry also leverages the excellent reputation of Ookla's data to validate claims used in marketing campaigns.

2.1 Points of note about Ookla and Speedtest®

- As official members of the ITU-T (Study Group 12), Ookla partners with leading global operators, test and measurement companies, infrastructure and hardware providers, network analytics providers, and regulators to help develop and define quality of service (QoS) and quality of experience (QoE) standards.
- Ookla is the exclusive provider of global network performance data to GSMA Intelligence (GSMAi), a trade body that represents the interests of mobile operators worldwide, uniting more than 750 operators with almost 400 companies in the broader mobile ecosystem.
- As a widely adopted consumer internet intelligence standard, Ookla fixed and mobile data is used by the U.S. Federal Communications Commission (FCC) for internal analysis, reports to Congress and public documents on the status of the telecommunications marketplace.

- Ookla's methodology is globally recognized and accepted as a standard way to measure speed performance, having been adopted by more than 400 enterprise clients worldwide.
- The Ookla consumer Speedtest methodology is designed to represent real user experience and our test platform has access to more than 15,000 servers worldwide and has conducted over 50 billion tests to date.
- Unlike solutions that can only estimate or attempt to model QoE, Ookla provides direct measurement of popular consumer activities such as web browsing, video streaming, video conferencing, gaming, and instant messaging.
- Ookla's controlled Rootmetrics drive and walk testing offers additional views into QoS, complements the company's crowdsourced measurements, and enables root cause analysis that helps providers or regulatory authorities not only identify *when* network issues occur but, critically, *why* issues are taking place and *how* to best resolve them.
- Ookla's combined QoS and QoE approach helps find and fix network issues that can be hidden to single platform solutions and offers actionable insights into how to improve the end-user's real-world connectivity experience.
- Ookla's Downtetector solutions improve connectivity through independent, third-party monitoring of online service providers, early alerting when network issues occur, and reduction of mean time to resolution.
- Ookla is fully GDPR compliant and transparent in its data collection methodologies.
- Ookla has a strong Data Science team and applies rigorous data science and filtering to ensure the analyzed results are an accurate and true reflection of real-world performance.
- As an independent third party, Ookla is able to provide validated endorsements of network performance. Ookla does this in more than 80 countries, substantiating marketing claims for more than 120 operators.

3. Ookla's response to TRAI consultation

3.1 Specific Comments on Chapter 3 and 5

Sl. No.	Chapter No.	Regulation No/Clause No.	Proposed provision in consultation paper	Suggested modification	Justification/ Global references with supporting data points if any
	Chapter 3	7. Quality of Service parameter in respect of which compliance is to be monitored by the service provider and reported to the Authority.	Repeated references to drive tests both operator and regulator performed.	A provision should be made to allow for many of these metrics to also be gathered by crowdsource means.	For cost purposes, convenience, and the fact that crowdsource metrics allow the ongoing collection of data outside of collection windows crowdsource metrics should also be included here.
	Chapter 5	3.2 Network availability	Coverage maps must be published	Adding the capacity for verified coverage or even more importantly verified QoS and QoE benchmarks	Too many coverage maps are based on marketed coverage or estimated coverage rather than verified coverage. For reference, Arcep, the French regulator, also publishes maps of measured QoS and QoE from drive tests

					and crowdsource metrics. This gives greater insight than just coverage.
	Chapter 5	3.2.6 Reporting of significant network outages:		Adding the capacity to utilize 3rd party sources for the tracking and management of outages could be beneficial and lower the outage resolution time. Tools like realtime Speedtest data for failed tests or Downdetector can bring 3rd party visibility to this issue but also allow for the automatic alerting of outages.	Without a validated way to understand when end users are impacted, operators might simply not report the smaller outages in the hope that they go unnoticed. Consuming and using 3rd party sources of data on outages could be a benefit.
	Chapter 5	3.12.2 Service Coverage:		There is no provision for the usage of crowdsource data in this measurement.	Crowdsource data can effectively map between indoor and outdoor coverage and would be a

					positive inclusion as a possible measurement device in this section.
	Chapter 5	4.3 Minimum download and upload speed	File size and TCP count of test	Many throughput tests like Ookla Speedtest allow for the dynamic allocation of TCP threads and file size.	Mandating TCP thread counts and file size criteria could remove valid samples collected by 3rd party sources and prevent them from being used in calculating the averages.
	Chapter 5	4.6 Measurement Setup		Significant consideration should be given to also including the usage of ITU recommendations "E.812 : Crowdsourcing approach for the assessment of end-to-end quality of service in fixed and mobile broadband networks," as well as Y.1545.1.	The measurement of QoS and QoE have moved on significantly since Y.1545.1 was recommended, and while it is still very relevant for a certain type of test, the newer E.812 recommendation allows for newer crowdsource metrics to be used as well.

	Chapter 5	6.2	The automation of process for capturing of primary data for benchmarks is critical to ensure the integrity of derived benchmarks through underlying primary data.	The TRAI could also supplement the operator reported data with real-time data coming from a 3rd party source to build out ongoing dashboards and reporting.	Centralizing this function based on a defined methodology allows for the monitoring of smaller regional ISPs at scale without the need for them to report data to the TRAI.
	Chapter 5	7.4	This [online reporting] will eliminate manual interventions in compilation of reports at the end of service provider and ensure integrity of QoS data while saving the manual efforts and associated cost.	Include the capacity for outsourcing this capacity to 3rd party crowdsource providers.	Allowing operators and ISPs to license this capacity from a 3rd party could also have the effect of eliminating the burden of reporting.
	Chapter 5	8. Publication of QoS		Numerous markets publish quarterly reports (e.g., CST in KSA) or annual reports (e.g., Arcep in	Ookla believes that committing to a cadence of published reports on a schedule is a vital public resource. It

				France).	<p>captures media attention, it focuses people to work on shared challenges, and it brings the complexity of running networks into the public domain.</p> <p>Ookla will continue to publish content, market reports, and our Global Index.</p>
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3.2 Chapter 6 Questions

Ookla has only answered the questions which are directly of relevance to our core products and expertise.

Question-1

What are the possible reasons for increasing gaps between the QoS reported by the service providers and the QoS experienced by the consumers? How this gap can be bridged?

Ookla Answer: Because fixed and mobile networks are increasingly complex multi-vendor environments, there are numerous network points and numerous ways, both estimated and direct, to measure and report on QoS.

The situation is much different for the average consumer. Rather than measuring or thinking of QoS from the network side, consumers typically use applications like Ookla Speedtest to gain insight into QoS.

This difference in tool availability and area of measurement focus can lead to a mismatch between what a consumer sees from end-to-end QoS measurement compared to network-side QoS measurement.

Looking at QoS only from an internal, network-side view can also miss end-to-end performance issues that impact a consumer's experience and create a disconnect between

what service providers see and what is delivered during real-world use cases. Ookla believes strongly in the exponential value created by bringing QoS and QoE insights together. The company's QoE testing, for instance, can help identify CDN or cloud bottlenecks in performance that impact the end user but might be hidden to an internal, network-only view of QoS.

In addition, the "experience" of QoS on end consumer devices is subject to interpretation by the user. While benchmarks for expected performance can be set (e.g., video buffering expectations), the manner in which people experience these is very different. A methodology which can take these variations into consideration is important. Very often, end users will mistake poor QoE for poor QoS. As noted above, effectively measuring both will help bridge the gap, provide greater clarity for consumers and providers alike, and show a fuller picture of how QoS and QoE intersect. Ookla also collects consumer sentiment data that can help show how QoS, QoE, and end-user impressions intersect.

Ensuring that the statistical methods for calculation are fit for purpose is also important. If operators are allowed to report on median QoS or even at times network reported maximum capable QoS, it can be hard to understand the differing experiences contained within these large averages. One 2 Gbps FTTH or 5G connection can mask a significant portion of poor QoS 3G tests.

Ookla recommends the following key actions be taken into consideration to help understand the gap between reported values and experienced values:

- Break out consumer initiated QoS measurements in isolation from QoS gathered in automatic ways
- Encourage operators to whitelist data (make this data free of charge outside of plans) used for QoS and QoE measurements to remove a data usage barrier for consumers.
 - This will encourage more tests
 - Engage consumers in testing
 - Eventually generate greater sample density in sparsely populated areas
- Consumer-initiated QoS measurements should be segmented based on key network dimensions (e.g., 3g, 4g, 5g, FTTH, DSL)
 - This segmentation should look at geographies
 - Device types
 - Networks
- Build a framework (or perhaps use the ITU [E.812](#)) to only use crowdsource metrics for the understanding of consumer QoS
- Make sure there is active filtering of attempts to manipulate any data
- Where possible, utilize 3rd-party data collections to validate network supplied data

Finally, although the convergence of fixed and wireless networks is helping extend seamless connectivity to new areas, it can also potentially cause a disruption in the QoS that consumers experience. That is, from an end user perspective, a consumer is looking for the

type of uninterrupted service that moving between fixed and wireless service helps enable; however, if performance varies as a user moves between these converged services, the consumer could not only experience a different QoS than what a service provider believes is being delivered but the consumer might associate that performance dip with a wireless provider rather than Wi-Fi performance (or vice-versa). As converged networks continue to grow, it will be important to ensure a baseline of QoS performance for each so that consumers experience truly uninterrupted service. Ookla insights, for instance, are helping providers identify where hotspots or Wi-Fi offloading will be most beneficial to both providers and users. In this way, providers can continue to optimise to ensure greater consistency of QoS between a provider's view and what end users experience.

Question-2

To support emerging applications and use cases please suggest a transparent framework for measurement and reporting of QoS and QoE especially in 4G and 5G networks considering relevant standards and global best practices.

Ookla is an ITU Study Group 12 (Quality of Service) delegate. The company helps drive the latest advances in QoS and QoE measurement and implementation. Beyond our participation in this type of industry standards body, Ookla's transparent methodologies help show the value that crowdsource data can bring to measuring QoS and QoE.

Crowdsource data (subject to ITU [E.812](#)) has the methodological robustness, consumer reach, and capacity to not only directly measure a broad range of services but also to gather core KPIs which can be built into compound indexes to measure the next generation of low latency tools.

In many markets and in many urban areas, the challenges of consistent QoS have been solved. However in a market of the size and geographic complexity of India, there will be areas and regions still in need of significant QoS monitoring, benchmarking, and intervention. It is unrealistic to expect for all of these to be covered by fixed probes, and it can be problematic to allow operators to self-regulate through data reporting. Crowdsource collected metrics can be an elegant solution to scale at will while offering a representative sample of the country.

For QoE reporting, measuring throughput, latency, loaded latency, jitter, and packet loss are the key building blocks for building benchmarks. However, the next step is measuring the direct experience from video, gaming, conferencing, instant messaging, and web browsing from consumer devices.

A flexible framework of crowdsource collected data sources focused on both QoE and QoS which is respectful of privacy but independent from operators has the potential to unlock the majority of consumer QoE and QoS insights needed.

Question-3

What should be the QoS parameters and corresponding benchmarks for ultra-reliable low latency communication (uRLLC), and massive machine type communications (mMTC)?

There is no simple one answer to this question as differing tools will measure latency in different ways depending on what they are trying to emulate or replicate. Ookla has addressed this issue by establishing a number of different latency measurements depending upon what segment you are trying to measure. For example, we have latency not under load, latency under load, multi-server latency, and finally UDP latency. With new use cases emerging every day and uRLLC and mMTC capabilities set to expand rapidly, it is critical to adopt a methodology that is flexible and can adapt to both today's and tomorrow's connectivity needs.

Question-8

What measures are required to accelerate the adoption of AI for management of QoE to reduce consumer complaints protectively and to enable near real time reporting of QoS performance to consumers?

AI models for real-time care scenarios can only work when there is sufficient data being generated and then made available to decision-making tools. Beyond establishing a framework that informs which data can and should be collected, it is critical to encourage operators to continuously grow that foundational pool of data. In tandem with this is creating a regulatory environment which is complementary to the collection of QoS and QoE data from end- user devices for the purpose of network improvement and optimisation. Once sufficient data is available, the next step is to make that data real time and actionable. Data alone is not enough. That data must be transformed into meaningful and actionable insights that help solve network issues or customer problems.

Privacy legislation is incredibly important: ensuring that people feel safe online and can access services without fear of data breaches is a given and foundational to Ookla's methodologies and daily practices. However, privacy legislation designed to minimize the power of advertisers can also have a cooling effect on the collection of QoS and QoE data. In any privacy legislation around telecommunications data, the rules governing the processing of QoS and QoE data should be determined in isolation to other types of data collection. Enabling the collection of data for the improvement of network infrastructure is beneficial to all. We also recommend working with operators to make QoS and QoE data free or outside of plan caps to encourage consumers to engage with testing programs. This should assist with adding to samples in areas of low population density as the cost barrier is removed.

Ookla brings these critical areas together—identifying what data should be collected, encouraging the continuous growth of the data pool thanks to the power of the Speedtest brand, and stringent privacy practices. The company is actively exploring how AI and ML can

be used to then transform the data collected into actionable insights that help operators identify and solve common network optimisation issues. Moreover, Ookla is using ML and clustering algorithms to identify and prioritise optimisation for issues that impact groups of users. This type of cluster identification is also used within Ookla's Downtdetector solutions to help providers' customer care and communication efforts when issues arise. Encouraging operators to explore this type of proactive issue identification and customer communication leads to more resilient and trusted networks. The key step that AI must help with is generating actionable insights: data alone is not enough and only the necessary precondition for unlocking actions that bring near real-time improvements and communications that benefit consumers.

Appendix 1

1. Ookla capabilities for regulators and governmental bodies

In many respects, Ookla created the standard for consumer-initiated network performance testing measurements on the web, natively on mobile devices and computer operating systems, and embedded on routers and industrial equipment.

Ookla is the preferred provider of network performance data for many regulatory bodies and trade organisations worldwide. As people and businesses rely more heavily on the internet for education, health and entertainment, access to broadband and mobile internet services doesn't just drive economic growth — it also impacts public safety and quality of life.

That's why providing universal access to fast, reliable internet service is a key priority for most regulators and governments around the world. Ookla® is fiercely committed to measuring the performance and availability of the internet worldwide and reporting on it transparently.

Regulatory bodies need definitive information to make informed policy decisions. A foundation of good governance is ensuring that policy makers have access to the highest-quality, most comprehensive data available in the market. While individual operators' standards for reporting on network performance and coverage may vary, Ookla provides independent and comprehensive data on network speeds, latency, availability, coverage and other key performance metrics.

Good governance is also predicated on policy makers being excellent stewards of public funds. When evaluating where networks need to be improved, it is imperative that regulators leverage unbiased information from private data sources with proven methodological practices.

1.1 How Regulators Use Ookla Data

- Map nationwide broadband service availability and mobile coverage to analyze geographic trends and see how people are or are not connecting with networks
- Access network coverage and consumer-initiated performance data that can be compared against telecommunications service providers' declared coverage maps to validate network claims
- Understand the quality, performance and location of existing networks, how operators are meeting the service obligations of their current agreements and where infrastructure investments are needed
- View how mobile networks perform by operator, spectrum band and device

- Access historical network performance and coverage data to understand trends and progress over time
- Inform policy and spectrum allocation decisions
- Track the rollout and adoption of new spectrum
- Analyze networks in high-traffic areas, popular venues and public spaces to ensure public safety
- Measure a country's network development over time, benchmarked against other countries, regions and the world

2. Items of potential interest

2.1 Speedtest Intelligence

Drawn from billions of measurements from consumer devices, Speedtest Intelligence provides comprehensive insights on virtually every fixed and mobile network worldwide. Compare network metrics by historical period, chipset, device, and other key variables.

Speedtest Intelligence provides data analysis and competitive insights on:

- Network performance
- Coverage and availability
- Video experience

2.2 Cell Analytics

Powered by performance, coverage, and signal measurements from the Ookla® Speedtest® network testing platform, Cell Analytics provides unparalleled intelligence about wireless service quality, RF measurements, data usage, user density (both indoors and outdoors), cell site locations, and much more — surfaced in one easy-to-navigate platform.

Cell Analytics rapidly assesses all networks and technologies down to the individual building level to help operators:

- Assess the performance, quality, and availability of existing networks
- Focus engineering effort where most needed
- Identify and fix network issues faster
- Locate opportunities for capacity expansion to existing macro cell sites
- Prioritize both network optimization and marketing efforts based on coverage, demand, and competitive benchmarking

2.3 Consumer QoE

Crowdsourced from billions of daily samples on hundreds of millions of consumer mobile devices worldwide, Ookla's powerful combination of network quality of service (QoS) and quality of experience (QoE) analytics helps operators understand and improve their networks.

Analyze in-depth consumer experience metrics for multiple services, including web browsing, streaming video, gaming, and video conferencing. Based on active tests through the SDK, this module allows you to:

- Visualize real-world user experience KPIs with detailed geographic location information
- Identify areas of weakness or strength
- Identify pain points that matter most to users, such as poor video playback or gaming latency
- Correlate user experience with radio environment, throughput, or latency
- Filter results by device, device capabilities, network technology, radio cells, locations, time, and more

2.4 Rootmetrics

Controlled testing and engineering insights for mobile network benchmarking. RootMetrics performs industry-best drive and walk testing. With deep insights on network performance, quality, and availability, you can understand where network issues arise — then go deeper to understand the root cause and prioritize optimization decisions to have the greatest impact on end-user experience.

2.5 Speedtest Powered

Speedtest Powered brings the advantage of Ookla® testing to any product or service capable of connecting to the internet, with an array of enterprise licensing options. With Speedtest Powered, companies are able to measure the strength of their infrastructure and the quality of customer-facing networks with the same trusted technology behind Speedtest®.

Testing integrations are offered through a variety of configurable technical implementations, including Speedtest Embedded, Speedtest SDK, and Speedtest Custom.

2.6 Downtetector

Comprehensive monitoring for online services. When customers think your service is down, every minute matters. Downtetector is the world's most popular platform to report problems with popular websites and connectivity services. With real-time analysis and verification of over 25 million user-submitted problem reports each month, Downtetector Enterprise helps you monitor key services, reduce troubleshooting costs, minimize service downtime, and rapidly resolve issues.