

Ookla response
to
Berec Draft Net Neutrality Regulatory
Assessment Methodology



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This document has been specifically prepared in response to the Berc Draft Net Neutrality Regulatory Assessment Methodology.

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

1. Introduction

The Ookla mission is to help make the internet better, faster and more accessible for everyone. We are very happy to add some feedback to this assessment and would like to note upfront that overall we are aligned to the technological and consumer features outlined within.

This document is structured to give the reader some background on Ookla who we are and why we have responded. It contains

- a high level overview of Ookla and our solutions
- direct responses to the document
- information on our work with other regulatory bodies
- A list of other potential items of interest

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

James Carroll - January 28th 2022

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2. Ookla background and solutions

Founded in 2006, Ookla is part of Ziff Davis (NASDAQ: ZD), an American media, internet information and services company. Headquartered in Seattle, Ookla is the global leader in mobile and fixed broadband network intelligence, testing applications, and related technologies. Ookla's flagship platform, Speedtest[®], provides invaluable insights into the performance, quality, and accessibility of networks worldwide.

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. Consumers make informed choices when they have accurate information on the quality and performance of their internet 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 Key Aspects of Ookla and Speedtest[®]

The Ookla solution detailed in this document comprises of the following value points:

- 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 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 app testing methodology is designed to represent real user experience and our test platform has access to more than 15,000 servers worldwide.
- 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.

2.2 Consumer focus

Many of the fundamentals of end-user internet speed throughput testing were designed, implemented and perfected by Ookla. As a company that has been the market leader in crowdsourced internet metrics for over a decade, we believe that part of our success is based on the privacy and respect that we show our loyal consumers. Speedtest® in all its forms is used on 100s of millions of devices each year, this global reach is unprecedented for an application which at its heart informs end-users with simple to digest KPIs relevant to them. This relationship with our consumers also ensures that end users engage with Speedtest® at times and in places where internet connectivity is relevant to them.

Ookla's data collection philosophy demands strict adherence to protecting the privacy of the users of Speedtest® and other applications. Our consumers are informed and fully aware of how we collect data and we provide consumers with the ability to disable this in our Application. We license Consumer-sourced datasets, which rely only on Ookla-branded products for collecting performance and coverage measurements.

2.3 Standard Consumer Benchmarking Tools

Speedtest® provides an accurate, consistent test experience across devices. We have mobile apps for both Android and iOS that are optimized to measure the specific intricacies of a mobile connection. There are dedicated Speedtest® apps for computers (Mac and Windows), a browser extension for Chrome, an AppleTV app and embedded solutions that integrate with routers, hardware and other connected devices. For developers who want to use the trusted technology and global server network behind Speedtest® to power their own solutions, we also offer a command-line interface tool (Speedtest® CLI) and an SDK. Our original web test at Speedtest.net covers most other platforms, and we continue to explore new platforms for Speedtest®.

| Application | Description | Location |
|------------------------|---|--|
| Speedtest.net | Consumer facing web application | speedtest.net |
| Speedtest® for Android | Android application, for phones, tablets, and similar devices | speedtest.net/apps/android Also available in the following app stores: <ul style="list-style-type: none">• Google Play Domestic• Google Play International• Amazon• Yandex• Samsung |

| | | |
|------------------------------|---|--|
| Speedtest® for iOS | iPhone and iPad | speedtest.net/apps/ios |
| Speedtest® for macOS | Mac desktops and laptops | speedtest.net/apps/mac |
| Speedtest® for Windows | Windows desktops and laptops Apple TV Command line application, for commercial use, embedded in routers and devices Older version published in 2013. Still functional yet no longer promoted or maintained | speedtest.net/apps/windows Available via the App Store and as standalone MSI for Windows 7 |
| Speedtest® for Windows Phone | Older version published in 2013. Still functional yet no longer promoted or maintained | Microsoft App Store |

2.4 Standard Ookla Enterprise Benchmarking Tools

1. Mobile Performance and Quality. Collected from the iOS and Android platforms. Consumer-initiated Speedtest® results provide accurate benchmarking of mobile technologies from 2G to 5G, broken down by date, operator, location, platform, chipset, model, and manufacturer.
2. Broadband Performance and Quality. Collected from all platforms. Consumer-initiated Speedtest® results provide accurate benchmarking of fixed technologies from DSL to multi-gigabit fiber broken down by date, provider, and location.
3. Mobile Background Sampling Coverage Data collects signal and quality information from our global android install base to build comprehensive maps and KPI views of international signal KPIs and coverage.

3. Ookla's response to Berc consultation

3.1 Overall comments

We were involved in the ITU work which produced the following "[Crowdsourcing approach for the assessment of end-to-end quality of service in fixed and mobile broadband networks](#)" recommendation for crowd source approaches.

While it is not totally applicable to this conversation some parts are relatable. The principle that it enabled a framework which was not directly prescriptive in small details but tried to group solutions into similar characteristics for approval we believe to be beneficial. This allows a number of similar methodologies to be considered compliant even though there are tweaks between their test methods.

This allows for a blended approach using tests which are already performed in the market by public facing crowd source applications like Ookla Speedtest. They can be used in conjunction with current Berc compliant testing providers.

Making the spec slightly more open would have the benefit of bringing more commercial providers into the market but also opening up many more test points from the tests already being performed on these platforms.

Arcep conducts a similar program with their code of conduct and also with planned access to the fixed line API also mentioned in this document.

3.2 Methodology Specific Comments

Server Selection

Traditionally Ookla has used a single server for throughput testing. This server selection was carried out using a mixture of location proximity and lowest latency. This resulted in the majority of tests occurring to what we term on-net servers.

We now deploy a multi server technology where 4 servers are used for a test. The primary server is still chosen by the location and latency method. This means that the data used to saturate a connection is coming from a mixture of on-net and off-net sources. It ensures that a single server is not the bottleneck in saturating the connection and that any bias which is being introduced by peering or local prioritisation can be neutralised.

HTTP/2

You recommend that multi server should be considered with HTTP/2. However multi-server can be recommend even with HTTP/1.1, as it ensures that a single server is not the bottleneck in saturating the connection

TCP Threads

Our standard test uses 4 threads but expands that on demand if more are required to saturate the connection.

Packet Loss

The challenges in correctly measuring packet loss are well understood in the document. The Ookla method of calculating packets loss is to traffic a select number of UDP packets between the consumer and server during the test and calculating the packet loss based on that.

This method continues to bring challenges as UDP filtering is often common on networks. We see this data in a subset of tests where it is successful.

Upload Speed

In the section on Speed Calculation we would like to note that the recipient measures throughput based on data received, not merely data sent. This is particularly important for Upload measurement, as it is the responsibility of the test server to report back throughput.

3.3 Anti Gaming Methods

We are happy to see an entire section dedicated to detecting and eradicating performance enhancing methods. Internally we call this program our anti gaming methods and we deploy a considerable amount of resources to not just focus on technical aspects of prioritising traffic but also the human patterns which showcase unusual or unlikely behaviour.

In specifics under section '4.2.1. Port throttling' we have also used the same port and compared encrypted traffic with non encrypted traffic as a way to detect performance differences. As opposed to using a control port.

3.4 Conclusion

We hope the small contribution we have made above is of some value and we would be happy to discuss further at any point. Broadly we are very happy with the structure and focus of the Berc document and we would be hopeful that Ookla could work closer with Berc and Berc standards in the future.

4. Ookla capabilities for regulators and governmental organisations

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 regulatory bodies 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 practises.

4.1 How Regulators Use Ookla Data

- Map nationwide broadband service availability and mobile coverage to analyse 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
- Analyse 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

4.2 Relevant References and Relationships

Ookla enjoys long-standing client relationships with internet service providers, mobile network operators, regulators, and other enterprises in over one hundred (100) countries, including large multinational group telecommunications operators, content providers, device manufacturers, and operators serving small and large nations alike.

International Telephone Union - ITU

Study and Expert Group partnerships

As official members, Ookla partners with leading global operators, test and measurement companies, infrastructure and hardware providers, network analytics providers and regulators to help develop and define policies, access technologies and quality standards.

ITU-T (Study Group 12)

SG12 is the expert group responsible for the development of international standards on performance, quality of service (QoS) and quality of experience (QoE).

Our data has been used in ITU publications - for example the Measuring the Information Society Report - <https://www.itu.int/pub/D-IND-ICTOI-2018>

GSMA

Ookla has a Data and content partnership with GSMA Intelligence. GSMA intelligence is the research and publication wing of the GSMA. Ookla is the exclusive provider of global network performance data to the GSMAi. Examples of content produced using our data are:

GSMA Connected Society - The State of Mobile Internet Connectivity

<https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/GSMA-State-of-Mobile-Internet-Connectivity-Report-2019.pdf>

The Mobile Economy:

<https://www.gsma.com/r/mobileeconomy/3/>

The World Bank

Ookla works with the World Bank Data Council on projects with real stakeholders and across the globe. The relationship is project based with World Bank researchers around the globe having access to Ookla Intelligence data on a per project basis. These projects range from telecommunication to societal development, to event tracking and projection. These projects are a mixture of academic, private governmental delivery and publication.

Currently, there are numerous world bank projects active based on Ookla data. They include:

- Broadband mapping and planning for a 5-year strategy for a large Eastern European country.
- Tracking internet patterns during the Covid pandemic in Southeast Asia
- Looking at West African internet transformation
- Tracking global movement to home work during the pandemic

Ookla can provide contact details of its Regulatory clients on request, in case Berc wishes to discuss Ookla solutions, its capabilities and use cases adopted by them.

5. Potential items of interest

5.1 Multi Server Testing

Ookla's test methodology aims to be the most accurate measure of a user's real-world network performance. To that end, we have fully enabled multi-server testing on our web, desktop and mobile Speedtest platforms. Testing simultaneously to multiple servers removes the dependency on a single server to fully saturate a connection and measure a user's maximum download throughput capacity.

Multi-server testing is important because ultra-high-speed connectivity services (such as fiber or 5G) require higher-capacity servers in order to generate enough traffic to saturate an end-user's connection. Peering relationships or cross-connectivity between providers can also be a bottleneck for internet speeds, so a single server's performance and the proximity of the selected server are both factors that can impact the accuracy of a network test. To mitigate these issues, our applications can now test to multiple servers in parallel to generate sufficient traffic to saturate the end-user's connection.

5.2 Testing high speeds

The ability to measure a network's full capacity is especially critical with modern network speeds increasing rapidly across connection types like 4G, 5G and fibre broadband. Speedtest® is capable of measuring the throughput of a 5G connection and other gigabit-and-beyond speeds. Speedtest® uses a client and server testing engine that dynamically scales the number of connections to the server in order to saturate and accurately measure client-side connections up to 10 Gbps. This allows Ookla to measure the full extent of real-world performance and overcome the effects of network bottlenecks such as TCP slow start (a transmission control protocol that avoids sending more data than the network is capable of forwarding).

5.3 Accurate 5G connection detection and identification

Not all 5G-capable devices natively identify the 5G connection type when reporting to applications. That's why Ookla has directly partnered with device manufacturers worldwide to implement accurate in-app 5G detection in Speedtest®. Consumers can reliably see when they're testing a 5G connection in the Speedtest® app, which provides a valuable feedback loop of 5G network service.

5.4 Background testing does not provide a reliable measurement of speed

Other testing providers often report much slower speeds than Speedtest®. That's because their tests either run in the background of other apps without consumers' knowledge or simply download a very small file from a content delivery network (CDN) or server. These quick tests cannot scale up to assess the full capacity of a connection or accurately determine upload speed — and the results do not indicate how a

connection might actually perform while using large amounts of data over a 5G connection. Because a significant amount of demand on the network must be generated for 5G carrier aggregation to even take effect, shorter-duration tests are incapable of ensuring the network assigns the maximum number of component carriers to the user equipment (UE) to trigger a 5G connection.

5.5 Changing Privacy Landscape

Ookla has always been committed to digital privacy. We have designed our privacy controls to protect the people who put their trust in Speedtest and DOWNDetector. We have [strict privacy measures](<https://www.ookla.com/shared/privacy>) in place, including strict adherence to international privacy regulations on how we handle personal information.

When you are using Ookla's apps, know that we ask for explicit permissions only for the data that is necessary to provide the service you've requested. We then take every reasonable step to ensure that your data is protected. While we do recommend that you turn on location sharing so we can provide features like coverage maps, you can opt out of precise location sharing at any time. We are committed to protecting the privacy of everyone who uses our apps.