

BEREC Report on the outcome of the public consultation on the draft BEREC Guidelines detailing Quality of Service Parameters

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Contents

Executive Summary..... 1

1. General comments..... 1

1.1. BEREK response..... 2

2. Comments to Question 1 3

2.1. BEREK response..... 7

3. Comments to Question 2 8

3.1. BEREK response..... 10

4. Comments to Question 3..... 11

4.1. BEREK response..... 12

5. Comments to Question 4 12

5.1. BEREK response..... 13

Executive Summary

This report summarises the responses received to the public consultation on the draft BEREC Report on Guidelines detailing Quality of Service Parameters (QoS) (hereinafter Guidelines). The public consultation was organised from 10 October till 10 November 2023 with the objective to gather stakeholders' comments and observations on the content of the draft BEREC Guidelines.

BEREC Guidelines detailing Quality of Service Parameters contains the QoS parameters to be measured, the applicable measurement methods and the content, form and manner of the information to be published, including possible quality certification mechanisms which relevant stakeholders, National regulatory authorities (NRA) in coordination with other competent authorities should take utmost account of.

In response to the consultation on the draft Guidelines, BEREC received 5 contributions from the following stakeholders:

1. ECTA
2. Pirllys S.L.
3. Ookla EMEA Office
4. GSMA
5. ETNO

In general, stakeholders welcomed the opportunity to comment on the draft BEREC Guidelines detailing Quality of Service Parameters. The following sections provide further comments, observations and recommendations expressed within the contributions during the public consultations.

1. General comments

ECTA, the European competitive telecommunications association, welcomes the opportunity to comment on the Draft BEREC Guidelines Detailing Quality of Service Parameters – BoR (23) 179 and to reply to the associated consultation questions.

Definitions of QoS and QoE by Pirllys S.L.

Pirllys S.L. begins by defining and differentiating QoS from QoE.

- QoS or Quality of Service is often associated with the real capacity of the cell [in Mbps]. In other words, the maximum speed achievable by a single user in the cell. It is this capacity that is shared by the subscribers active simultaneously in the cell. In this document QoS is related to cell capacity. "QoS (Quality of Service) appeared in the 90s to designate a set of techniques for ensuring the routing of traffic. Since then, the acronym QoS has been used to designate performance improvement. But QoS metrics such as bandwidth, delay, jitter and loss rate, which are generally used to guarantee services, fail to measure the subjectivity associated with human perception. Network operators are tending to move towards policies based on a global approach to end-to-end quality, and so Quality of Experience (QoE) was born."
- The QoE or Quality of Experience delivered to subscribers, such as the connection speed of sessions when subscribers are active [in Mbps]. This QoE has a value at a given time and place. The sum of the QoEs of all subscribers active simultaneously in the cell cannot exceed the QoS value. In addition, as long as there is excess capacity in relation to the traffic load in the cell, the QoE of each subscriber will correspond to the speed requested by the desired service. For example, 5 HD video sessions at 18Mbps, 26 web browsing sessions at 200Kbps, etc... If the aggregation of the usage, or load, continues approaching the QoS value, the QoE of subscribers will be progressively degraded.

Pirllys S.L. states that thanks to their innovation based on the exploitation of open source software (OSS) data, coupled with an artificial intelligence engine based on the Kaufman-Roberts mathematical model, users can know at any time, and at any point in the network, what QoE they will benefit from (and not a theoretical QoS). They can also track the evolution of this QoE month after month.

Ookla notes, as a crowdsourced Internet test and measurement company, **Ookla's** responses relate only to the components within the consultation which they consider themselves to be experts in: namely, the consumer testing of internet communications.

The **GSMA** thanks BEREC for the opportunity to comment on BEREC's draft Guidelines detailing QoS Parameters. Below **GSMA** provides general comments to the guidelines and their feedback

to the specific questions raised by BEREC. **GSMA** hopes its contribution will be helpful and serve as a constructive contribution to BEREC's deliberations on its final guidelines.

General comments to BEREC's guidelines by **GSMA**

Whilst **GSMA** appreciates that BEREC leaves it open to the Member States to select the best mechanisms for assessing QoS based on market specifics, they note this has led to significant fragmentation across the Member States in terms of approach to QoS (measurement, publication / transparency). **GSMA** therefore asks BEREC whether they (BEREC) would consider highlighting what they consider to be 'best practices' to support further alignment on approach to QoS? **GSMA** continues to be concerned about the interlock between QoS and the open internet rules. For example: There is a growing concern that the excessive usage of a small group of exceptionally heavy users are having negative ramifications on the QoE of normal end-users, due to congestion on the network. They may impact QoS outcomes. Yet – it is very difficult to implement 'controls' on these parties, as a consequence of Open Internet Regulation (OIR) and related rules. E.g.,

- (i) Prohibiting tethering, due to device neutrality.
- (ii) Inability to apply reasonable traffic management measures to groups of exceptionally heavy users, as unclear if within reasonable traffic management.

GSMA would also highlight that the issue of establishing that so-called 'specialised services' do not impact on general quality of internet access (undefined), remains a challenge, and will be an increasing issue as use cases relaying on differentiation proliferate. To avoid regulatory overburden, it should therefore be made clear that operators are only required to apply QoS parameters to the core services they offer, and not to services that are marginal.

As a macro comment, they note that many of the parameters listed are barely perceptible to the customer and have no meaningful impact on their QoE. These therefore simply risk becoming a further administrative burden on the operators without bringing a benefit to customers (also further detailed below). **GSMA** thus ask BEREC to consider whether each parameter is material to determining the QoE for end-users.

ETNO welcomes this opportunity to provide input to the BEREC updating of the Guidelines for detailing the QoS parameters.

1.1. BEREC response

Regarding the general remarks from **Pirlys** and **GSMA**, BEREC acknowledges the position of these respondents that a difference between QoS and QoE can be drawn and that some of the technical parameters used to describe the quality of electronic communications services not always reflect end user perception best¹. Therefore, BEREC will continue to work on analysing parameters that are easier to understand for end users and better reflect users' experience.

¹ The differences are stated in Point 16 of the Draft Guidelines.

Regarding a general remark from **GSMA**, BEREC acknowledges the position of GSMA that the BEREC QoS Guidelines do not necessarily lead to a fully aligned QoS regime across Member States. However, it is essential to underscore that guidelines, as opposed to hard law or regulations, do not carry the same legally binding force. Hence, BEREC is of the view that the BEREC Guidelines serve as recommendations intended to provide an adaptable framework for achieving a common understanding and promoting best practices. That will provide a further step towards increased QoS harmonisation across the European Union. But BEREC points out that the EECC and the Guidelines highlight that there is a degree of flexibility allowed when deciding which QoS parameters to measure, that should be specified by NRAs. Given this, it is understandable that the QoS parameters and measurement methodologies may differ among Member States.

Regarding the general remark from **GSMA** about the relation between the OIR and the Guidelines, BEREC clarifies that the Guidelines are deemed as a supporting document to Member States when implementing QoS parameters on national level. The Guidelines are not meant to solve any challenges that may occur from the OIR.

Furthermore, OIR has been taken into account in the development of the Guidelines, as well as the currently applicable BEREC Net Neutrality Regulatory Assessment Methodology BoR (22) 72, BEREC Guidelines on the Implementation of the Open Internet Regulation BoR (22) 81, and also other relevant reports.

2. Comments to Question 1

Q: Do the existing Guidelines detailing Quality of Service (QoS) parameters assist stakeholders? Are there any challenges to implementing the Guidelines?

In relation to the first question, **ECTA** believes that the existing Guidelines parameters adequately assist stakeholders.

Pirlys S.L. notes that:

1. Context They believe that the existing guidelines on QoS parameters are only partially helpful to stakeholders. To address these difficulties, they would like to place the issue in a historical context.

For 2G-GSM technology, in the 90s, the three relevant parameters for quality of service or **QoS** were:

- The level of radio coverage
- Voice call rejection rates

- Quality of communications, or MOS [Mean Opinion Score]. By controlling these 3 relevant parameters for 2G, operators could ensure a good QoS for their subscribers while guaranteeing the profitability of their investments.

2. The tools used in the past to adjust QoS when these parameters were below threshold values, they corrected the problems:

- by deploying new sites when there was no radio coverage or when the strength of the signal received was insufficient (leading to low MOS). This work was carried out using traditional radio planning software tools
- by deploying additional capacity, as soon as the incoming call rejection rate was above 2% (ITU standard). This was done using the Erlang table and collected performance values, from the OSS.

Pirlys S.L. also mentions that: Radio planning tools were upgraded for 3G, 4G and 5G technologies, but the Erlang table is no more relevant. This is why the reconciliation of capacity planning and QoS adjustment is challenging. In fact, operators are measuring a QoE value, but they no longer have a tool equivalent to the Erlang table to assess and correct QoS. We provide an innovative solution.

Additionally, **Pirlys S.L.** declares that there is:

3. A technological barrier: The problem is the technical barrier of dimensioning capacity resources, like the Channel Elements and Codes for UMTS and the Physical Resource Blocks for LTE/5G at base station levels. In general, on mobile telephony station, there is either not enough capacity, generating congestion, or there is too much capacity in relation to the cell load, generating low and long ROI. Investment is inefficient. PwC [2], Accenture [3], EY [4, 5], Analysis Mason [6] and the GSMA [7] all confirm the inefficiency of operators' investments and the need for rationalization. Today, the guidelines are methods of measuring:

- Latency
- Jitter
- Packet loss

Admittedly, this information is important in real-time or near-real-time applications. But in all other use cases, these aspects are less crucial, because the user will eventually access his service, after a delay.

On the other hand, if the service is never provided because of saturation due to an under dimensioning of resources, it is really detrimental to the end user. The service will never be provided if the QoS is too degraded in relation to the services requested. QoS measures or capacity measures were not included in the guidelines because there was no state of the art solution until now. This is no longer the case. As for the measurement of QoE values, there are two main factors to be considered: the traffic model and the subscriber's location. At peak times, the QoE value [connection or session speed] will be low, and the closer the subscriber is to the cell edge, the lower the QoE value will be. Conversely, at off-peak times (at night, for example) the QoE value will be the highest, and the closer the subscriber is to the base station, the higher the QoE value will be.

At this point, **Pirlys S.L.** concludes that the measurement of QoS or cell capacity values and QoE values be included in the guidelines. We also recommend that the QoE measurement values be accompanied by information on the traffic model and the measurement location within the radio coverage footprint. These measurements are now available by combining the network performance values collected at OSS level with the Kaufman-Roberts model as in the Pirlys tool.

In **Ookla's** own experience, one of the key difficulties industry bodies and specifically regulators have is convincing citizens and consumers to use the services that they have at their disposal. Curating, maintaining and servicing an international crowd is a difficult task. Many regulators launch applications, test programs, policies and expensive data collection apparatuses only to find that these gain limited traction and do not produce the desired results. Industry companies, like Ookla, offer some of these very services internationally in a unified manner to all on the globe and are often the first port of call for citizens and consumers to test their connectivity.

This tends to produce a number of different issues:

- Consumer confusion, where the consumer expectations are being driven by their interaction with services like Ookla Speedtest, but the regulatory decisions are being driven by other data points.
- Methodological mismatch, in which different services are testing similar items in different ways leading to market confusion. For example a consumer trying to complain that their service is impacted using Speedtest results but being told these results need to come from a different solution to be valid.
- Low test volumes for regulator-deployed solutions.

Ookla notes that the consultation and 'BoR (22) 72 Net Neutrality Regulatory Assessment Methodology' both have significant references for a desire to harmonize test methodologies. It is the belief of Ookla that test characteristics which allow for a number of different methodologies to be deployed depending on what is most relevant in a market would be positive. In Ookla's experience, restrictive guidelines tend to lead to low adoption and low consumer interaction.

GSMA and ETNO note that Article 104 of the EECC is aimed at ensuring the transparency and comparability of reliable, user-friendly, and up-to-date information for end-users on the quality of internet access and publicly available interpersonal communications services. To facilitate comparability across the European Union and to reduce compliance costs, BEREC is empowered to adopt a unified framework in the form of guidelines on relevant measurable QoS parameters and the applicable methodology which NRAs in coordination with other competent authorities should take utmost account of. The European harmonization of QoS parameters for data collection and publication practices should result in substantive benefits, such as enabling comparability among Member States and providing better information on the European electronic communications market, while at the same time promoting the consistent application of regulatory obligations and improving transparency for end-users and public authorities in relation to QoS. However, in GSMA's and ETNO's view, the goals of harmonization and transparency provided by Article 104 of the EECC are not realized in practice for the reasons stated below.

Firstly, so far, there are different practices in countries across the EU as far as the implementation of transparency of QoS is concerned - some countries, for example, Lithuania has established extensive and burdensome mandatory requirements in national legislation that are difficult to follow in practice, while in other countries there is no legal framework, and the scope of publicly announced information varies significantly. It should be noted that when national NRAs establish the mandatory obligations on operators to assess all parameters specified in Article 104 of the EECC (Annex X) according to the methodology provided for in the Guidelines (for example, the principle of measurement (protocols, measurement points), statistical processing, formulas), they do not take into account the potential complexity and additional administrative burden imposed on operators and do not provide for specific measurement conditions (e.g. how to manage the variety of connection conditions (good, poor coverage, movement), time (distribution over time of hour, day, week, month, year), diversity of technologies) to ensure comparability. All major methodology assumptions that should assure result comparability are left for each operator to decide individually. As a result, variation from country to country is so significant that it requires specific burdensome and costly implementation per country operation creating an incomparable scope of parameters that cannot be used on a daily basis to improve quality and results in no practical value neither for end-user nor operator.

Secondly, the relevance and comparability of QoS parameter metrics are key in fulfilling the aim of BEREC guidelines. Parameter metrics for one end-user are only relevant to the relevant geographical place and per technology (mobile data vs XDSL vs Fibre, etc.) and if the metrics provided are comparable. However, in GSMA's and ETNO's view, this important element is missing in the current guidelines and their application practices.

GSMA and **ETNO** believe that the measurements of the general experience in the network are of limited relevance for one end-user within a specific geographical position.

- Some parameters, for example, call signalling delays - CSD/CASD/CRD (Table 1 QoS Parameters as set out in Annex X of the EECC) have no feasible measurement method available when traffic cases are produced by several operators and necessary measuring points are not available for on.
- Some parameters, for example, unsuccessful call ratio (Table 1 QoS Parameters as set out in Annex X of the EECC) do not provide any possibility for the end-user to compare one service provider to another, i.e., when voice traffic cases are produced by several operators.
- When there are several measurement methods implemented by service providers, for example, data transmission speed (upload and download) (Table 2 QoS Parameters not set out in Annex X of the EECC), it gives significantly different metrics for one parameter, which makes comparison between service providers almost impossible.
- One measuring method with one tool, for example, dropped call ratio (Table 1 QoS Parameters as set out in Annex X of the EECC) gives different results pending mobile handset and/or network vendor due to signalling or counters being differently implemented, which makes comparison between service providers almost impossible.
- Some technical metrics, for example, data transmission speed (upload and download) (Table 2 QoS Parameters not set out in Annex X of the EECC), depend on the end-user

behaviour i.e. different data applications require different data transmission speeds (for example, end-user A uses a service that works well with 5 Mbps and will only use 5 Mbps even if 10 Mbps speed is available in the network and end-user B uses a service that works well with 10 Mbps and uses 10 Mbps, in these cases metrics will show end-user A using 5Mbps and end-user B using 10 Mbps, which makes it impossible to distinguish which end user has got the best service quality.

- Some of the parameters, for example, call signalling delays - CSD/CASD/CRD (Table 1 QoS Parameters as set out in Annex X of the EECC) are of a highly technical nature and require special expert knowledge to be understood therefore, are incomprehensible to the average end-user.

2.1. BEREC response

ECTA

BEREC appreciates ECTA's perspective that the parameters adequately assist stakeholders. Looking ahead, BEREC will continue to exchange views with stakeholders to achieve our shared goals.

Pirlys S.L

BEREC acknowledges that insights regarding the measurement of QoS, cell capacity, and QoE values are valuable and appreciates the effort Pirlys S.L. put into suggesting improvements to the Guidelines. Having that in mind, BEREC noted a suggestion to leverage the Kaufman-Roberts model, as demonstrated in the Pirlys tool. In BEREC ongoing efforts to refine methodologies, these suggestions will be surely taken under consideration for future updates.

OOKLA

BEREC welcomes the insights on the challenges faced by industry bodies and regulators in promoting service usage among citizens and consumers. BEREC recognizes Ookla's role as a provider for connectivity testing and notes the issues raised.

GSMA and ETNO

Regarding comments and bringing attention to the challenges associated with the implementation of Article 104 of the EECC, BEREC recognizes the significance of guaranteeing transparency, comparability, and the provision of reliable information regarding the quality of internet access and interpersonal communication services for end-users. BEREC sets a goal to work towards a future where the harmonization and transparency objectives outlined in Article 104 are actualised. BEREC recognizes the complexities involved and is committed to actively engaging with relevant stakeholders to address the concerns raised and move towards a more unified and streamlined approach. In its approach to the mentioned parameters, it's important to highlight that BEREC adheres to industry standards set by ETSI, ITU, and 3GPP. Therefore, BEREC appreciates the importance of continuous improvement and welcomes feedback from stakeholders. Despite the evolving nature of certain technologies and parameters defined, some of which stakeholders

deem outdated, it is noteworthy that they continue to be actively utilized. The ongoing commitment is to persistently refine the Guidelines in alignment with emerging developments. Received comments and insights, especially those aligned with the standards of ETSI, ITU, and 3GPP, will be carefully considered in BEREC's future work stream to enhance and optimize the Guidelines.

3. Comments to Question 2

Q: Which points in the Guidelines could be more detailed or clarified?

ECTA's remarks on the BEREC amendment proposals to the Guidelines currently in force:

Having assessed both the contents of the Draft BEREC Guidelines Detailing Quality of Service Parameters, with a focus only on the revisions proposed by BEREC vis-à-vis the existing text of the Guidelines (<https://www.berec.europa.eu/en/document-categories/berec/regulatory-best-practices/guidelines/berec-guidelines-detailing-quality-of-service-parameters-0>), and the question raised by BEREC specifically in the context of this public consultation aimed at collecting the elements that should be further detailed and clarified, ECTA is convinced that the final text of the Guidelines should be amended on the following points:

While **ECTA** agrees with BEREC's proposals for revised references in Table 1A (IAS QoS parameters), **ECTA** believes that in order to provide the needed clarity to impacted stakeholders, the measurement method column in Table 1A should report exactly the wording of Section 3.2 of BoR (22) 72 (the currently applicable BEREC Net Neutrality Regulatory Assessment Methodology).

Before Table 2 (QoS parameters not set out in Annex X of the EECC), BEREC should explain the motivations underlying the inclusion of 2 new QoS items (i.e., number of customer complaints per data collection period and data transmission speed) and in particular:

- a. motivate why their inclusion is relevant for improving the existing BEREC Guidelines (especially the item regarding the number of customer complaints per data collection period without any distinction on the related motivations of those complaints appears not fit for purpose for improving the existing BEREC Guidelines),
- b. provide a list of the EU Member States that already include those new items in their parameter set.

ECTA believes that this is a crucial element in order to ensure the needed transparency to all impacted stakeholders and at the same time to ensure well-informed decision-making by the NRAs that will consider the new version of the Guidelines in their Member States.

ECTA notes BEREC's proposal to amend the Table 3 (QoS parameters relevant for end-users with disabilities), and, to insert, for voice communication and for real-time text, reference to the draft standards under revision. While ECTA understands and appreciates the spirit of BEREC in proposing such amendments, for the sake of clarity and legal certainty, **ECTA** believes that ideally

the tables should be updated only when the standard's review is completed, and the final text is approved. In fact, as BEREC specifies in the Draft Guidelines (See point 46, page 20 of the Draft Guidelines): *"The standard specifying the quality of service parameters and the relevant measurement methods is ETSI EN 301 549 V3.2.1 (2021-03). It should be noted that this standard is currently under revision following the publication of ETSI TR 103 708 V1.1.1 (2022-08). In the tables below a reference to the changes proposed by ETSI TR 103 708 V1.1.1 (2022-08) is made"*.

However, if BEREC prefers to amend the tables with references to draft standards, **ECTA** believes that the final text of the reviewed BEREC Guidelines, in a new paragraph before Table 3, should definitely clarify that:

- a. BEREC will proceed to issue an updated version of the Guidelines, replacing Table 3 with the final standards as soon as those standards are approved.
- b. All amendments in this table be applied by the NRAs and the other relevant authorities in collaboration with them, only starting from 28 June 2025. In fact, in accordance with the EU Accessibility Act, and as underlined by BEREC in the draft Guidelines themselves (See point 45, page 19 of the Draft Guidelines), the date by which the Member States should apply the measures required by the Act is 28 June 2025.

Pirllys S.L. supports as it is mentioned in their previous chapter, that there is one measure that needs to be integrated and clarified, that seems to be a misuse of language by the industry and needs to be corrected: "QoS".

Pirllys S.L. suggests as regards the **definition**, that since 3G, 4G and 5G systems are trunked systems, the performance of each, depends on the actual capacity deployed, the number of simultaneous active users and their respective activity ratios, i.e. active subscribers share a single resource.

In addition, **Pirllys S.L.** points out that as they have already defined QoS, which is cell capacity, i.e. the maximum performance that the cell can provide. Despite random assertions in the industry, it is highly likely that QoS is in fact rarely, if ever, measured. They continue: *"Why is this? Because the only measurement techniques available to mobile operators today are Drive Tests and Crowdsourcing. Both are measurements taken from mobile phones, hence, in the uplink direction only (from the mobile to the BTS). In the uplink direction, the only way to measure QoS is to be the only active user of the cell at the time of measurement."*

As a result, this is never the case with Crowdsourcing and Drive Test. As soon as 2, 3 or 4 mobile devices are active, what the 5th device measures is the remaining resource shared between the 5 active phones. In reality, it's a measure of QoE, Quality of Experience or Quality Delivered at a given point in time of all the active phones."

Ookla notes that although network availability, is mentioned as a key characteristic of Mobile, there is no clarity as to how such a metric can be measured. i.e. using crowdsourcing metrics to assess true coverage as opposed to advertised coverage. In addition, Ookla notes that there is a

reference to “Probability of successful connection in an area covered by the network” without an explanation of a desired way to measure that. Lastly, Ookla is questioning whether monitoring by crowdsource metrics should be on a scheduled drive test scenario or should it be based upon operator reported data.

In **GSMA**'s and **ETNO**'s view, detailing and clarifying of QoS parameters in an extensive way does not solve any of the challenges to fulfil the aim of harmonization and transparency as provided by Article 104 of the EEC and to assist service providers, where relevance and comparability are key. In this respect, GSMA and ETNO believe that guidelines could rather specify subjective service quality measurements and highlight the need for common NRA measurements, in order to achieve compatibility between service providers in the respective country and between member states.

3.1. BEREC response

ECTA

Regarding the comment on revised references, and on the needed clarity to impacted stakeholders, BEREC notes that only the reference to BoR (22) 72 was used for future-proof and consistency purposes.

Regarding the comment on the need for further explanation on the motivations underlying the inclusion of two new QoS items in Table 2, BEREC is of the opinion that the aim of these Guidelines is to give assistance to any parties that are willing to perform measurements of any QoS parameters they choose and to do so in a consistent manner. The two added parameters are already measured by several stakeholders, therefore they were included in the Guidelines for the sake of completeness. As for the suggestion to provide a list of the EU Member States that already include those new parameters, this information was not included, in order to maintain consistency as implementation can change in the various EU Member States in the future.

Regarding the comment about amending the tables in the Guidelines with draft standards under revision and the expressed preference that ideally the tables should be updated only when the standard's review is completed and approved, BEREC is of the opinion that although such a scenario would be ideal, this information is still useful for the reader. As for further clarifications regarding the standards under review, BEREC appreciates the suggestions and will take them into account for future work.

Pirlys S.L.

Regarding the comment on clarification of the term “QoS”, BEREC acknowledges the concern about the usage of language in the text and the underlying differences that might occur. However, Guidelines detail the QoS parameters in a way that is specifically laid out in the document's Scope (chapter 1.3), setting a clear base of the set framework of the Guidelines.

Ookla

Regarding the comment on the best approach on how to choose the method of measurement data collection, BEREC considers that the measuring party has to decide how to interpret crowdsourced measurements when assessing network availability, and whether other methods to collect data would be an option in a specific situation.

GSMA and ETNO

Regarding the suggestion to specify subjective service quality measurements in order to fulfil the aim of harmonization and transparency at NRA or service providers' measurements, BEREC highlights that QoS Guidelines provide the necessary guidance to NRAs and other competent authorities in order to ensure common criteria and a consistent regulatory approach. This is without prejudice to the tasks established for NRAs, which are closest to the electronic communications markets and their local conditions. Therefore, the Guidelines serve as an additional tool for the practices applied by Member States as regards the measurements performed using appropriate standards, keeping in mind the goals of transparency and harmonization in the European electronic communication market.

4. Comments to Question 3

Q: Which parameters, listed, or even not listed, in Annex X of EECC, mostly assist end-users in evaluating the quality of service?

Ookla advocates that BoR (22) 72 Net Neutrality Regulatory Assessment Methodology lists throughput both up and down along with packet loss, latency, loaded latency and jitter in its definitions. **Ookla** believes that throughput metrics are very important for reasons other than net neutrality. For example, identifying unserved or underserved areas continues to be important, and throughput measurements play an important role in this effort. However, the connectivity landscape is changing and the evolution of networks is in a critical point. For many consumers, access to networks is no longer the primary barrier to enjoying improved connectivity. Rather, the conversation is now shifting from QoS to QoE, with the goal of ensuring that any network optimization or expansion is actually impacting real-world consumer experience positively. In this context, understanding the latency under load is one of the most important future metrics in expanding QoS towards QoE.

GSMA and **ETNO** support that there is a rather limited scope of parameters (for example, data transmission speed for internet access service and call set-up failure probability for interpersonal communications services) per service which could assist end-user in distinguishing service quality and the current extensive set of nearly all possible parameters can be minimized.

4.1. BEREC response

Ookla

BEREC recognizes that end-user demands on network (fixed and mobile) performance are different than in the past and the ways to assess how the end-users experience is shaped are increasingly popular. Incorporating new indicators like latency under load will be taken into account in a future version of the QoS Guidelines.

GSMA and ETNO

BEREC notes that the QoS Guidelines are structured taking into account both the rapid development of new technologies, where network's performance measurement methodologies have not yet been standardized, as well as the fact that deployment of such networks is not yet fully advanced.

In this respect, the most relevant QoS parameters were included, and related methodologies and standards were listed.

5. Comments to Question 4

Q: Do you have any other relevant comment?

ECTA notes the absence of a text with mark-ups in BEREC's document, to enable stakeholders to clearly identify, the amendments that are proposed in relation to the existing Guidelines. **ECTA** proposes for future revisions and reviews of the Guideline documents, to provide a draft with indication in mark-up of the proposed modifications.

Pirlys S.L. agrees with BEREC's statement that, "QoS is becoming increasingly complex to manage, measure and regulate". They claim that they can explain this, by the ambiguity of the definition and the lack of an equivalent to the past Erlang table technique and they propose a way forward, to take efficient actions to ensure continuous best possible performance.

Additionally, **Pirlys S.L.** provide relevant material to support their statements above.

Ookla considers that QoE testing directly to key services or testing towards specific server end points of relevance, is going to be increasingly important over the coming five years. They note that, as concessions need to be made in test scenarios for the ever-changing and sometimes

proprietary nature of these services, a framework to allow for methodologies of QoE testing to be adopted by regulators and government bodies would be advantageous.

In addition, Ookla states that the company's complementary QoE insights show how network performance is actually impacting key tasks such as web browsing, video streaming, video conferencing, gaming, and more, and therefore uniting technical insights with consumer experiences, i.e. QoS with QoE data is critical.

In addition, parameter Specific Comments were provided by **Ookla**, related to Network Availability, Network Outages, Downlink + Uplink Throughput, Latency and Jitter.

Ookla's also notes that consumer-collected data points have a high value in the validation of services and deployed services and that as a company they provide tools and data to assist regulators. **Ookla** urges BEREC to consider the speed of industry as opposed to the speed of regulation in any new regulations it is published.

Additionally, **Ookla** provides relevant material to support their statements above.

GSMA and **ETNO** argue that the currently identified parameters for benchmarking and comparison derail the established market competition, which has been very positive for the markets historically, and shift focus onto minute and tech-centric parameters, lacking relevancy for the larger public and the individual end-user. In addition, they note that there is a risk that this benchmarking creates unmanageable expectation discrepancy and thereby dissatisfaction amongst the end-users. Benchmarking of this type negatively impacts larger operators, geographically and technically, vs more technically focused, e.g., fibre only, or geographically / segment-limiting actors of the market. **Lastly, GSMA** believes that objectivity and comparability of service quality parameters can only be achieved when NRAs measure and publish the relevant parameters.

ETNO states that as perfect comparability is not realistic and could lead to significantly high costs without tangible gain, they believe comparability should be limited to those parameters that are effectively making sense and are used by the larger public and individual end-users to assess the quality of service.

5.1. BEREC response

ECTA

BEREC appreciates the comments related to comparability of the Guidelines and will take into account this in the future work, especially if the changes are significant, but in BEREC's view, the Guidelines are structured in a way that allows comparability. Relevant QoS parameters, standards and definitions are clearly structured in tables as in the previous document, which makes it easier to navigate and find relevant information and changes.

Pirlys S.L. and Ookla

BEREC values the proposed methodologies and insights on measuring QoS/QoE, but highlights that the parameters and methodologies presented at the report are based on the existing regulation, on the input received from the NRAs, as well as relevant ETSI and ITU standards. NRAs have the freedom to choose the way of technical implementation while measuring and presenting the QoS parameters.

On the point made by **GSMA and ETNO** on the lack of usability of the Guidelines structure for the end user, BEREC notes that the Guidelines are intended to be used by the NRAs as an additional tool to guide them through the process of implementing the EECC's requirements. Implementation at national level and the specificities on the representation of parameters that are useful to the end-user can vary.

On the point made by **GSMA** on the value in publishing the parameters measured by the NRAs, BEREC highlights, that this is indeed the case in many countries. Publication and related information on QoS parameters at NRAs' sites is a common practice, regardless of who is performing the measurements.

Lastly, BEREC highlights that the methodologies and proposals for improvement presented in detail by the stakeholders, will be taken into account in a future update of the Guidelines related with QoS/QoE.