Body of European Regulators
for Electronic Communications
BEREC

BEREC Report on the outcome of the public consultation on the draft Net Neutrality Regulatory Assessment Methodology

9 June 2022

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1. Introduction

BEREC has prepared an update to the BEREC Net Neutrality Regulatory Assessment Methodology[1] ("the RAM" or "the Methodology"), adopted in 2017. The aim of the Methodology is to provide guidance to National Regulatory Authorities (NRAs), following the provisions of Regulation (EU) 2015/2120 ("the Regulation")[2] and the BEREC Open Internet Guidelines ("Guidelines").

A draft of the updated RAM was issued for public consultation from 15 December 2021 to 28 January 2022.

BEREC welcomes all contributions and thanks all stakeholders for their submissions. In total, BEREC received five contributions to the public consultation, which are published on the BEREC website:

1. ECO
2. ECTA
3. ETNO/GSMA
4. NOS
5. Ookla

In accordance with BEREC's policy on public consultations, this report summarises stakeholders' views in response to the consultation and how they have been taken into account.

Chapter 2 of this report provides a summary of general comments received and BEREC's response to such comments, while chapters 3 to 7 provide a summary of the specific comments related to individual chapters and/or sections of the draft RAM as well as BEREC's response.

2. General comments

Stakeholder responses

In the introduction to their response to the public consultation, **ETNO/GSMA**[3] stated their belief that it is essential to ensure that the implementation of the Regulation results in greater clarity for consumers. **ETNO/GSMA** also considered that the implementation of the Regulation should not create unfair or undue burden on the telecommunications sector, at a time in which there is a focus on increasing investment and the quality of networks.

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[1] BoR (21) 165 Draft BEREC Net Neutrality Regulatory Assessment Methodology
[2] REGULATION (EU) 2015/2120 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2015 laying down measures concerning open internet access and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No 531/2012 on roaming on public mobile communications networks with the Union http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32015R2120
[3] ETNO is the European Telecommunications Network Operators' Association. GSMA (the GSM Association) is an industry organisation that represents the interests of mobile network operators worldwide.

Further, **ETNO/GSMA** welcomed BEREC's commitment that quality of service (QoS) measurement parameters and methodologies must be based on already existing consolidated technical and scientific foundations. **ETNO/GSMA** note that the selection of parameters that are considered relevant and representative from the end-user perspective to measure internet access service (IAS) quality is already set in the relevant ETSI standards as defined by the STQ Technical Committee.

In addition, **ETNO/GSMA** welcomed BEREC's finding that different measurement tools serve different objectives. Monitoring customers' experience about the IAS or applications is very different compared to the monitoring of contractual compliance of IAS providers. These differences must be translated into the RAM or rather different methodologies advanced in the RAM. For **ETNO/GSMA**, BEREC should acknowledge that a range of NRAs have already implemented monitoring systems. According to **ETNO/GSMA**, where these established systems already deliver sufficient results, NRAs should refrain from readjustments that burden industry and may confuse customers who have got used to the established tool.

With respect to test methodologies, **NOS**[4] commented that there are specific aspects that raise concerns on the reliability of the results of QoS assessment tests and should be revised in the final draft, including the approach set out in Chapter 3 of the consultation document, specifically the limitations of ensuring reliable measurement environments in methodologies embedded in browsers. Further, **NOS** understands that tests should be carried out within an ISP's network, in order to minimise biases resulting from factors that are outside the operator's capacity to address.

According to **NOS**, the preference of usage of HTTPS advocated by BEREC is also problematic, as **NOS** does not see any advantage in such an approach, and it may have problematic consequences in terms of result bias.

Regarding the publication of results, **NOS** agrees with the need for the disclosure of "*[…] any identified bias related to measurement methodology likely to create comparability issues, especially when comparing ISPs […]*", and the transparency requirements detailed in the document, to avoid misinterpretation of results and comparability bias.

NOS also notes that it fully agrees with BEREC's assessment regarding certified monitoring mechanisms.

BEREC response

BEREC thanks the stakeholders for their feedback and has carefully considered the respondents' views.

As outlined in Section 3.1.1 of the RAM, BEREC took the opportunity as part of this update to discuss, agree and make explicit a consolidated set of requirements to facilitate the use cases relevant to a regulatory scenario. On that basis, wherever possible and in line with those requirements, BEREC strives to reuse existing methodologies and concepts to measure the parameters relevant to the Regulation. Key to the requirements is the recognition that the regulatory use case of empowering a broad range of end-users with the ability to measure the

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[4] NOS is a Portuguese fixed and mobile telecommunications (and media) operator, formed from the 2013 merger of Zon Multimedia and Optimus Telecommunications.

performance of their IAS with the minimum of additional burden, is not adequately served in any of the available standardised measurement methodologies.

BEREC acknowledges that there may be pre-existing systems which should not necessarily be burdened with a significant upgrade cost as a result of this update and recommend that NRAs assess this situation on a case-by-case basis, noting that the updated Methodology does not necessarily make pre-existing measurements systems obsolete.

In relation to the submission about the placement of the test server and potential issues with browser-based tests – this is based on the long-standing BEREC position that measurements must be taken against a server outside the ISP being measured in order to observe the performance of the ISP's network end-to-end. On the topic of HTTP(S) – the use of TLS is recommended, but optional. TLS is considered to be the state-of-the-art, but implementers are free to not use it where there is a risk of measurement bias as a result of a performance impact due to limitations in measurement clients.

Stakeholder responses

ECO[5] considers some aspects to be particularly crucial and central for the methodology implementing net neutrality measures. For example, there should be more differentiation on the usage of UDP (user datagram protocol), no need for Wi-Fi measurement or for device extension, the importance of end-user environment, the need for transparent traffic management detection, and the question of monitoring IAS quality.

BEREC response

BEREC thanks the stakeholder for the submission. BEREC would like to remark that Section 3.1.6 of the RAM describes how the use of pure UDP-based testing methodologies is not technically possible in most end-user in-browser deployment scenarios.

It can be further clarified that the intention of the first requirement in Section 3.1.1 is simply to allow for a potential future scenario where an implementing party might choose to deploy a speed test client on a different type of consumer device and "no artificial restrictions" should prevent this.

3. Measuring Internet access service quality

Stakeholder responses

In their joint response, **ETNO/GSMA** welcomed the approach detailed in Chapter 3 (and its sections) of the consultation document and welcomed the efforts made by BEREC to find a methodical approach to assessing service quality. **ETNO/GSMA** fully support BEREC's view that measurements must be accurate particularly if regulatory or increased transparency initiatives such as maps are to be deployed within the measurement data.

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[5] The European Communications Office (ECO) was formally established on 1 July 2009 following the merger of the European Radiocommunications Office (ERO) and the European Telecommunications Office (ETO).

According to **ETNO/GSMA**, it is critical that the overall speed measurement methodology follows industry standard approaches on measurement. Further, no conclusion should be drawn from speed tests, packet loss or latency issues if the data speed testing process is not designed to ensure it is testing the unmitigated speed available to the end-user.

ETNO/GSMA also stated that recommended tools such as web browsers have significant weaknesses regarding interference from the end-user environment. If such tools are deployed, they need to be counterbalanced through smart solutions if the tool is meant to be accurate.

ETNO/GSMA noted the BEREC use of HTTP(s), which, according to them, remains a concern as BEREC should consistently refer to HTTPS as a preference compared to HTTP.

BEREC's view that testing should be done using web browser or an on-device app remains a concern for **ETNO/GSMA**, as the measurement is located outside of ISPs' networks. According to **ETNO/GSMA**, operators can only control their own networks, thus measurements should preferably be done within the ISPs' networks.

ETNO/GSMA also note that new functionalities introduced by device manufactures and thus outside the control of IAS providers (such as Apple's Privacy Relay), introduce a new paradigm in how users access the internet through apps and browsers, potentially changing performance of IAS. For **ETNO/GSMA** these new functionalities increase the difficulty in the measurement of IAS QoS and should be taken into account in BEREC's assessment.

BEREC response

BEREC thanks the stakeholder for the submission. BEREC notes the concerns of ETNO/GSMA about the possibility to use (unencrypted) HTTP for measurement, while noting that NOS, in their opening comments (Chapter 2 above), simultaneously expressed opposing concerns about the use of HTTPS. BEREC perceives the provided text to strike a good balance, giving preference to HTTPS connections while still allowing the use of unencrypted HTTP for measurements.

BEREC notes that industry stakeholders have concerns about factors within the end-user's domain influencing the measurement, a topic extensively covered in Chapter 5 of the RAM. BEREC considers that this methodology should empower end-users to easily measure actual performance of their IAS without significant technical hurdles or restrictions to overcome, while simultaneously identifying the potential for end-user environment issues.

The concerns about VPNs in the context of the expected widespread use of Apple Privacy Relay are noted and a footnote to the existing text in Section 5.1.5 has been added accordingly.

In relation to the point about standardised measurement approaches – while drafting of this update BEREC assessed the available approaches from various organisations and as mentioned previously, concluded that none would meet BERECs requirements for an end-user focused speed testing methodology.

Stakeholder responses

Regarding Section 3.1.1. (Speed measurement overall methodology) of the consultation document, specifically in relation to "*where a speed measurement is initiated by a human end-user*", **ETNO/GSMA** noted their concern about the requirement to "*execute it via the equipment that they usually use to access the IAS. No artificial restrictions in the methodology should prevent the measurement from running on other hardware such as game consoles/modem clients/TV-boxes etc.*" **ETNO/GSMA**'s concern is based on two issues:

1. "*It is disproportionate, unreliable, and unnecessary. To extent an end-user is using an internet connection, likely home broadband, to connect a device such as a game console, or Smart TV, then that broadband is also very likely being used to provide connectivity to e.g. a laptop or smartphone, through which it is already possible to test IAS.*

2. *It is impractical. Many of the potential devices used to access the internet, will have neither (i) access to a browser-based speed-test application; (ii) an in-built speed-testing application. To facilitate this requirement, operators would likely have to work with numerous device manufacturers/software developers to ensure that this capability is built-in to new end-user devices. It would be even more challenging for existing devices.*"

BEREC response

BEREC thanks the stakeholder for the submission and notes the concerns about the possibility of the use of devices other than Personal Computers for measurement. However, BEREC is of the view that a methodology should in general not prohibit the use of such devices in an evolving landscape where the utility and computing power of consumer electronics continuously increases. It should also be noted that many electronic devices such as game consoles and televisions already have access to app stores similar to smartphones, while their respective operating systems are shipped with reasonably up-to-date browsers. Nevertheless, potential shortcomings or restrictions of these devices are noted and reflected in Chapter 5 of the RAM and should be considered by the implementing party of any measurement system based on the consumer device market at the time of implementation.

Furthermore, Section 5.3 of the RAM points out that measurement records can be enriched with data on the kind of equipment used as measurement client. This would allow for the validation of measurement results and exclusion of any potentially limiting influence of the end-user equipment.

Finally, BEREC fundamentally disagrees with general statements that "*No speed measurement based on customer terminals can be considered reliable*" and that "*Monitoring customers' experience about the IAS or applications is very different compared to the monitoring of contractual compliance of IAS providers*".

Stakeholder responses

Regarding Section 3.1.6 *(Testing methodologies specified by other organisations)*, **ECO** evaluates and questions BEREC's explanation about why UDP is not used for download and upload measurement as unreasonable.

ECO quotes the Draft Net Neutrality Regulatory Assessment Methodology of BEREC:

> "*ITU and the Broadband Forum have issued standards based upon UDP-based IP capacity measurement methodologies. Furthermore, the IETF has published RFC 9097 Metrics and Methods for One-way IP Capacity on the Standards Track.*"[6]

ECO interprets this as clearly showing that BEREC recognises that UDP has several advantages, i.e. no handshake and no flow control and it has a standardised methodology, which is widely accepted. According to **ECO**, as BEREC fails to show reasonable reasons not to take this approach, BEREC needs to recommend a more differentiated approach. Several browsers can process UDP, for example, WebRTC (Realtime communication) often uses UDP. Thus, for **ECO**, BEREC should also recommend UDP and name the specific browsers, which can process it. Moreover, in Member States that provide an installable desktop-app, there is no technical reason at all to dispense UDP. Such apps avoid the problem that some browsers and consumers cannot handle UDP properly. **ECO** summarises that BEREC must recommend UDP in measurement apps for the sake of the accuracy and acceptance of measurements.

BEREC response

BEREC thanks the stakeholder for the submission and notes the preference of UDP-based speed measurements in this submission. Due to the reasons listed above and in Section 3.1.6 of the RAM, BEREC disagrees that UDP is appropriate for speed measurement at this time, and as previously noted it is not compliant with BEREC's requirements. A HTTP-based measurement is more in line with the requirements, as it reflects the speed available to the end-user, including the effects of packet loss and latency.

While UDP-based measurement could be promising in the future, be it via WebRTC, HTTP/3 or other implementations, current TCP-based methodologies are well-known, robust, widely used, easily available and in line with the requirements. In the interim period, BEREC does not consider it appropriate to define a parallel alternative UDP-based methodology which would be limited to installable clients or specific browsers.

Stakeholder responses

Regarding Section 3.3. (Packet loss measurements), **ETNO/GSMA** fully agreed that samples of measurements need to be sufficiently high, including different sizes of data packages to provide the full picture of networks' performance (e.g. large packages illustrate availability of higher network performance) and measurements should be done symmetrically over the whole day, including peak hours, at different days during the week. This is particularly

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[6] BoR (21) 165 Draft BEREC Net Neutrality Regulatory Assessment Methodology, p. 14

important to ensure that measurements are representative when it comes to contractual compliance.

BEREC response

BEREC thanks ETNO/GSMA for this submission.

Stakeholder responses

Ookla commented on a number of methodology-related aspects, as follows:

- Server selection: traditionally the respondent 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 the respondent terms on-net servers. The respondent now deploys a multi-server technology where four 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: BEREC recommends that multi-server should be considered with HTTP/2. According to the respondent, 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: the respondent's standard test uses four 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 BEREC document. The respondent's 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. The respondent sees this data in a subset of tests where it is successful.

- Upload Speed: regarding Section 3.1.1. (Speed measurement overall methodology) in BEREC's document, the respondent 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.

BEREC response

BEREC thanks the stakeholder for bringing up the possibilities of the use of different servers during a measurement. BEREC notes this possibility but cannot include it in the Methodology as the simultaneous use of different servers at different locations is not in line with the aim of minimizing the end-to-end delay between the test server and the user and could introduce uncertainty about the source of any measured degradation in QoS.

The use of multiple servers at the same location however is noted by BEREC as a concept that is compatible with the regulatory measurement use case and could be used to improve the robustness of deployments in the future, and as such this has been included in the updated methodology document.

BEREC is furthermore grateful for the experience and clarifications shared by the stakeholder overall and specifically in relation to the effect of UDP filtering in measuring packet loss; speed calculation being based on data transferred rather than data received (the methodology wording has been updated accordingly) and the number of TCP threads/connections. BEREC notes that Section 3.1.2 of the RAM does not preclude an increase in the thread count during a test, should this be appropriate.

4. Detecting differentiated traffic management practices

Stakeholder responses

In their joint response, **ETNO/GSMA** restated (having said similar in previous submissions) their opposition to associate aspects of higher level of networks, such as the blockage of TCP/UDP ports, to the features of IP connectivity provided by the IAS. According to **ETNO/GSMA**, the management of TCP/UDP level and higher levels usually does not concern the IAS service, apart from legitimate functionalities such as the Network Address Translation (NAT) usage. In general, **ETNO/GSMA** note, the adoption of protection measures such as virus checkers and parental controls has increased year over year and have an impact on connectivity testing. In the opinion of **ETNO/GSMA**, BEREC and NRAs should take this situation of utmost relevance when assessing traffic management practices, especially in the crowdsourcing approach, as it can easily result in incorrect conclusions.

BEREC response

BEREC notes the stakeholder's position in relation to the higher level of networks, however in BEREC's view these aspects are an integral part of the Regulation and end-users should be empowered to measure their ISP's compliance with the same. In relation to the protection measures referenced, BEREC is aware of the effect these can have on any measurement, hence their inclusion in Section 5.1.5 of the Methodology.

5. End-user environment

Stakeholder responses

In their joint response, **ETNO/GSMA** welcomed the consultation discussion on the best approach to ISP speed assessment for end-users. The quality of modems and end-user apps, software and terminal equipment does impact the accuracy of the speed test. In relation to mobile testing the end-user terminal, its location, and the typology of the geography close to the end-user are factors impacting the end-user speed. **ETNO/GSMA** have argued before that the most reliable information on maximum speed available in mobile networks is provided through drive tests.

ETNO/GSMA appreciate the recognition that a variety of external factors can impact the accuracy of IAS quality measurements. For example, against both fixed network end-user environment, and the mobile network end-user environment, the activation of background software like VPNs or local DNS manipulation, may impact the performance level achievable by the measurement device.

ETNO/GSMA also highlight a specific issue they see with 'new' forms of VPN that are being adopted, such as Apple Private Relay (APR). Where APR is activated, there are three consequences relevant to measuring QoS for specific applications:

1. To the extent that an application is impacted by APR when activated, the IAS provider loses visibility of the specific applications that end-users are accessing. It is still possible to measures metrics such as speed as a whole, but not possible to determine whether, for example, a specific application is achieving the speed or other QoS criteria, that would be necessary for the application to run effectively (or may have been contractually committed to). This is particularly problematic in scenarios where a guaranteed QoS is required for a specific application.

2. This is exacerbated by fact that the activation of APR will cause a degradation in the QoS for the application. Essentially, the activation of APR (i) introduces two additional 'hops' in the routing of the traffic, (impacting on latency), and (ii) means that, instead of the traffic handling occurring over this IAS providers network, it will be handled by Apple, where the operator has no visibility over their DNS response, transit link routing etc.

3. **ETNO/GSMA** further note that Apple in the context of these activities, are not currently within scope of the net neutrality framework. Therefore, if Apple are to handle an increasing share of internet browsing, then these activities will also be outside the clear ambit of the regulatory framework.

According to **ETNO/GSMA**, it would be beneficial if the Guidelines made reference to these new forms of 'VPN', to provide further guidance on how to address these in IAS quality measurements.

BEREC response

BEREC thanks the stakeholder for the submission and notes that the purpose of the measurement tool is to facilitate the regulatory use case of end-users performing IAS quality measurements on their individual IAS. This use case has a different set of goals, and a different audience when compared to drive tests, which are also valid in their own context.

Chapter 5 of the RAM describes how the end-user environment can have a potential influence on measurement results. The same is true for the fixed access. The fact that an end-user's measured speed depends on the coverage (which in itself depends on the geography) in mobile access case is obvious, so it is not considered necessary to include it in the RAM.

The end-user environmental aspects to be considered and to what extent these factors are addressed by the measurement methodology is up to the relevant NRA. The Methodology provides a comprehensive overview of the areas to consider, and guidance on ways to address, exclude or minimise the impact of the effect of environmental factors.

In Section 5.1.5 of the RAM, the effect of e.g. VPNs, firewalls, and other software is addressed.

As already stated above, VPNs (including the specific example mentioned in the submission, the impact of which does not differ significantly from pre-existing VPN services) are out of scope. Measurements undertaken via a VPN should not be considered to be a valid assessment of IAS quality.

If it is possible to detect that a test has been made over VPN, this should be marked in the results.

Stakeholder responses

Regarding Section 5.2.5 (Access method), **ECO** supports BEREC's recommendation, that Wi-Fi measurement is not to be used in fixed networks. ISPs have no influence on the many conditions that are relevant for Wi-Fi throughput in consumers' wireless home networks, e.g. the distance from router to device, walls, interferences, inaccurate settings, cross traffic etc.

ECO emphasises the importance of end-user environment by explaining that BEREC correctly takes into account end-users individual set-up and technical environment. Many factors can reduce download and upload rates significantly, like network cards and adapters, in-house cable, overloaded Wi-Fi channels. Therefore, in order to measure accurately and to achieve robust results, all relevant factors in the end-user environment have to be considered. Otherwise, the performance of the ISP's network is not reflected correctly.

BEREC response

BEREC agrees with the points made by the stakeholder and notes that the importance of the end-user environment is addressed in detail in Chapter 5 of the RAM.

Stakeholder responses

According to **ECO**, there is no need for device extension as they consider it inappropriate that measurements shall be possible on any kind of end-user device. Allowing – inter alia – game consoles, modem clients, and TV-boxes to perform measurements would create more uncertainty than reliability. The different operating systems in these devices and the installed network cards and the difficulties to identify each one's performance will lead to disproportional expenses for the ISPs, especially regarding customer service. Furthermore, such devices are not usually optimised for traffic but for graphical performance and other criteria. It is therefore obvious that speed tests will not reflect the limitations of the ISP's network but those of the device. Finally, this extension is not necessary. It is very improbable that a user who wants to measure his internet speed is forced to get back to such unusual devices, i.e. has neither smartphone nor PC/laptop, on which a standard operating system is running.

BEREC response

As referred to above, there is no intention for an explicit device extension and the requirement that there are 'no artificial restrictions' should not be taken as a requirement for support of consumer electronic devices.

Stakeholder responses

Another important aspect that **ECO** mentioned is the need for transparent traffic management detection. They argue that BEREC correctly states which factors can influence the traffic management detection. It is important that NRAs take these factors into consideration when assessing traffic management.

BEREC response

BEREC notes this submission with thanks.

Stakeholder responses

Besides the important technical factors, **ECTA** pointed out another relevant aspect of the end-user environment and it is the necessary skills of end-users to conduct these tests properly from a methodological point of view. As **ECTA** explained, in particular to the case of crowdsourced measurement approach, both in fixed and mobile network-based connections (Chapter 5), the whole testing process as it is described in the draft report might require that the end-users have high digital skills and competences. Some end-users could be highly skilled. However, looking at most of the Member States and considering the demographic data associated to the digital and technical skills encountered therein, it could be difficult to obtain statistically representative quality tests and complicate the data validation and test post processing.

ECTA, therefore, respectfully invites BEREC to recommend that those tests are performed byidentifying first an adequate (but not limited) set of end-users with technical skills. Secondly, those tests should rely on performance measurements by automatic technical means in those end-users' environments rather than relying on the end-user declaration.

BEREC response

BEREC thanks the stakeholders for their feedback and has carefully considered the respondents' views related to end-user skills.

As mentioned previously, BEREC's overall approach is to empower all end-users to assess the quality of the IAS being provided to them and to identify and mitigate any risks of measurement bias resulting from this. As a result, Chapter 5 of the Methodology comprehensively identifies these factors and provides guidance on how to address them by design of the measurement concept, while Chapter 6 clarifies that additional statistical processing of the acquired data may be needed.

Chapter 5 of the Methodology states that automatic technical means, where possible, tend to be more reliable than end-user declarations and that the local hardware and software needs to be analysed when gathering information on the end user environment. In light of this stance, it is not reasonable to restrict measurements only to a subset of end-users.

For a crowd-sourced approach where measurement data is used for a general overview of the general IAS quality, it is already mentioned in Chapter 6 that specific care should be taken to statistically validate the data and to identify any bias.

6. General IAS quality assessment methodology

Stakeholder responses

In their joint response, **ETNO/GSMA** stated that in relation to measuring improvements in general IAS quality, they welcome the discussion in the consultation document and the need to ensure outlying data is addressed when comparing with previous measurement data. In addition, they note the need to ensure there is consistency in the measurement approach on mobile devices and in the surrounding measurement environment, which is important to ensure comparative data is accurate.

ETNO/GSMA reiterated the need to explain fully the measurement process and the timeframe and suggest that there are caveats to the results, which may explain IAS speed differences. They also stated they are concerned with Section 6.4.1. (Proposed methodology for measuring the improvement in general IAS quality), which sets out that average download and upload speeds, that are calculated for preceding years, could be used to 'predict' forecasting for the following years' speeds. This predictive model can then be applied in the following years to assess whether ISPs have met the predictions. **ETNO/GSMA** is also concerned that there is no basis in the Regulation for making such a predictive assessment. It is also not clear what ramifications are anticipated if ISPs (either on average or individually) do not meet the speed predictions. For **ETNO/GSMA**, this is particularly concerning given that speed predictions based on previous years are not seen as an accurate predictor of network/internet access quality. They stated that if BEREC intends to maintain this section in the document, then further clarity on what these predictions are being used for, and also clear caveats as to the accuracy of this data, should be included.

With respect to Section 6.4.3. (Further Analysis: effect of specialised services on IAS), **ETNO/GSMA** appreciated that there is a recognition of the clear difference between measurements for mobile and fixed end-users, and the different metrics that the impact of specialised services should be measured against. They also welcomed the recognition that the impact would need to be measured over a longer period than a simple snapshot. However, according to **ETNO/GSMA**, the following practical issues remain:

1. It is clear that the burden of proof remains on the provider of the specialised services to establish that there is no impact on the IAS. However, no guidance is given on how this might be done in advance of launch of a specialised service. It would be useful if clear guidance on how limited testing in a live environment may be done, without risk of regulatory intervention.

2. Reference is made to the idea that a specialised service should be under constant review by the provider, and should stop being delivered as a specialised service in cases where the 'best efforts' network is capable of delivering the service. This risks a freeze on innovation, if investment is required to develop an end-to-end specialised service now, which in the future must revert to using best-efforts internet. **ETNO/GSMA** argue that operators should continue to offer these given that demand for these services exist.

3. With respect to mobile networks, **ETNO/GSMA** appreciate the recognition that there are challenges in ascertaining the actual impact of a specialised service on the mobile

network. In particular, the broader Net Neutrality Guidelines reflect the recitals in the Regulation, setting out that the general quality of IAS for end-users should not be deemed to incur a detriment where the aggregate negative impact of specialised services is "unavoidable, minimal and limited to a short duration".

According to **ETNO/GSMA**, it would be helpful if, in the Methodology Guidelines, further guidance was given on these criteria, to support operators in making this assessment. They expect, all things being equal, the number of services that qualify as 'specialised services' to increase in the future. This will result in the issues identified above being exacerbated further. In particular, placing a burden of proof on the provider to run assessments on a case by case and rolling basis will not be sustainable. For **ETNO/GSMA**, any update to the Guidelines should reflect this.

BEREC response

BEREC thanks the stakeholder for the submission and takes note of the concerns regarding speed prediction. The predictive methodology proposed in the RAM is a way that NRAs may analyse measurement results when considering the promotion of "*continued availability of non-discriminatory internet access services at levels of quality that reflect advances in technology*."

The proposed methodology contains caveats and measures to mitigate potential issues – the methodology consists of several steps, and the steps preceding the analysis describe that the NRA should be "*eliminating false, manipulated or irrelevant measurements*".

In relation to the comment on the need to fully explain the measurement process, the Methodology has been updated to suggest that any prediction made should be accompanied by information on the parameters used to make it, referring to the data points listed in Section 6.5 of the RAM.

BEREC does not share the reasoning regarding specialised services considering the following arguments.

On the one hand, the impact on general IAS quality of specialised services is assessed on a case-by-case basis, so providing a generic approach to assess the impact of specialised service would not be practical. However, it should be noted that there is nothing to prevent an ISP from discussing their planned approach with the relevant NRA, should they wish.

On the other hand, once a service can be delivered on 'best efforts' networks (where the optimisation is no longer "*necessary in order to meet requirements of the content, applications or services for a specific level of quality*"), that service should no longer be treated as a specialised service. BEREC does not consider that this approach risks a freeze on innovation and considers this assertion to be unproven. Finally, it should be noted that this principle was not introduced in the RAM update, but rather in the BEREC OI Guidelines published as BoR (20) 112.

Stakeholder responses

ECO disagrees with the black box approach to monitor general IAS quality. **ECO** notes that Article 5 (1), sentence 1 of the Regulation requires that:

"*national regulatory authorities (NRA) shall closely monitor and ensure compliance with Articles 3 and 4, and shall promote the continued availability of non-discriminatory internet access services at levels of quality that reflect advances in technology.*"

ECO interprets this to mean that the rule grants no power to NRAs but references to the powers laid down in Articles 3 and 4. Therefore, the legal basis for monitoring general internet access quality is Article 3 (5), second subparagraph of the Regulation. It states that special services shall not be to the detriment of the availability or general quality of internet access services for end-users. Therefore, the essential precondition for monitoring the general IAS quality is the existence of special services. This is supported by the last sentence of Recital (17) which refers to the 'impact' of special services and calls for a comparison.

BEREC response

BEREC thanks the stakeholder for the submission. BEREC takes a position that end-users should be empowered to verify that the contractual commitments relating to IAS performance are being met and that the IAS complies with the Regulation generally. Therefore, BEREC stands by the statement that the black box approach is the most suitable way to monitor the general quality of IAS, and the only way for end-users to measure their internet quality. Indeed, as indicated in Chapter 6, it would be difficult or impossible to isolate the internet access service and the specialised service(s).

BEREC does not share the stated interpretation of the Regulation when it comes to assessing the general IAS quality and does not exclude the possibility that an NRA would monitor the general IAS quality without necessarily quantifying the impact of specialised services, in order to follow how this QoS is developing through time for example.

It should be noted that any alternative to a black box approach to monitoring general IAS quality would likely be more invasive and time consuming from the perspective of the ISP.

Stakeholder responses

ECTA argues that, with respect to the methodology described, targeted at the measurement of IAS quality in both the download and upload directions, the draft Report[7], firstly recommends that where measurements are performed against a test server, this server should be located outside the IAS provider's network. The test server, in order to ensure an adequate connectivity between the server and the IAS provider to minimise any influence upon the measurements, can be located at, or close to the national internet exchange point (IXP). Secondly, the report states that depending on the specific national situation, measurement servers may be located at more than one IXP location.

ECTA highlights that foreseeing only one test server creates a risk of insufficient representation of the real performance that the test aims at measuring considering that connectivity to the national internet exchange point is not necessarily representative for each network, and for end-to-end internet connectivity. This is the case notably because some (major) operators do not exchange traffic at open national internet exchanges, and/or may only do so for a very limited proportion of traffic. **ECTA**, therefore, respectfully invites BEREC

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[7] See Section 3, pp. 5-6

to recommend, where it is technically possible, an adequate degree of representation for the test, which should consider a sufficiently large set of servers.

BEREC response

BEREC thanks the stakeholder for the submission and agrees that test server locations should, where it is technically possible, guarantee that each measurement is representative. BEREC acknowledges that there should be adequate connectivity between the server and the IAS provider to minimise any influence upon the measurements. Locating the test server at, or close to the national Internet exchange point (IXP) is recommended generally in the RAM, however the choice of server location is paramount and in specific cases different server locations might be applicable. In relation to the point about the representativeness of measurements made against a single server, as mentioned above BEREC has updated the RAM document to acknowledge cases where multiple servers may be used, however a given test should only be made against server(s) in a single physical location.

7. Individual results assessment

Stakeholder responses

In their joint response, **ETNO/GSMA** reiterated in relation to normally available speed that this key performance indicator (KPI) is very problematic. No speed can be consistently ensured for a given end-user. Equally, advertised speed relates to a market level speed and does not refer to speeds consistently delivered to all end-users.

ETNO/GSMA appreciated BEREC's confirmation the regulations do not require Member States to certify a monitoring mechanism. This area is the subject of much difference in Member States and **ETNO/GSMA** welcomed BEREC's view that several conditions and evidence need to be available if end-users are to be able to conclude their contract IAS is not what is advertised or contractually offered. The process of implementing the consumers' right to remedies in relation to an ISP not achieving their contractual speed is a matter for Member States and NRAs to consider.

BEREC response

BEREC notes the points about normally available and advertised speeds and would refer to the its Guidelines published as BoR (20) 112 in this regard.

Stakeholder responses

With respect to the publication of the data regarding the measurement tests' results, **ECTA** highlighted that the draft Report does not refer to the different performance and quality levels that can derive from the specific types of wholesale access acquired by the internet access providers (often from the incumbent operators designated with SMP). For instance, in terms of access to the same infrastructure by the access seeker, it is well known that bitstream access would tend to ensure a different and inferior network performance when measured at the end-user level, with respect to an access based on passive access to the same underlying infrastructure. For this reason, it is of utmost importance that:

- the data analysis process explicitly includes the examination of any potential impact of the test performance from the underlying wholesale access. Any test result impacted by the poor performances of the wholesale access should be rejected.

- before its publication, any data is subject to an explanation on the criteria and the upstream inputs that were used for the measurement and the operators subject to such measurement are informed by the NRAs before the measurement and the data is released. This is necessary to avoid those inadequate direct comparisons could be used for commercial level to damage one party with respect to the other.

BEREC response

BEREC thanks the stakeholder for the submission. BEREC notes the concerns outlined regarding the relative performance of the different types of wholesale access but believes that any performance difference should be reflected in the performance/speed commitments made in end-user contracts. In this light, it is not apparent how or why a measurement system would detect poor performance of wholesale access and BEREC believes that any unacceptable performance level is a matter between the wholesale-provider and wholesale-customer. Of course, the above point does not prevent the relevant NRA from taking action should it be deemed necessary.