

Draft BEREC Guidelines on Very High Capacity Networks (BoR (20) 47)

TIM's response to the public consultation – 30 April 2020

Executive summary

TIM welcomes the opportunity to comment on the draft BEREC guidelines on Very High Capacity Networks (VHCN).

We appreciate the guidelines' objective of contributing to the harmonisation of the VHCN definition in the EU, anyhow we deem that the draft BEREC guidelines should be improved in several respects in order to ensure a full compliance with the European Electronic Communications Code (EECC).

A balanced definition of VHCN is pivotal for the adoption of an effective and efficient regulatory approach by the NRAs as well as for the achievement of the European Gigabit Society targets. Indeed, connectivity objectives at 2025, as defined by the EC Communication, have been at the basis of the EECC provisions and should be considered as a reference for the definition of VHCN, also taking into account that BEREC will have to update the guidelines over time.

Furthermore, while TIM sincerely appreciates BEREC's intention to push as much as possible the quality definition of European networks in 2025 and beyond, the current economic disruption will cause the industry to face a short-medium term challenge, paying particular attention to cost efficiency. Therefore, we consider that a certain degree of flexibility and an evolutionary approach to the functional parameters should be taken, now and for the coming years, into an even greater consideration.

TIM believes that in order to ensure the compliance with the provisions of the EECC and being fit-for-purpose for promoting the interests of citizens, BEREC guidelines should:

- 1. Consider throughput instead of data rate:** BEREC does not consider the interdependence between the different parameters provided for in the EECC and it completely disregards the bandwidth experienced by end users. Indeed, data rate is not representative of the end-to-end QoS experienced by the end user, which instead actually depends on the application throughput. A throughput-based threshold would allow operators a greater flexibility in deciding how to efficiently reach a certain network performance, also in the light of network costs and national specificities.
- 2. Ensure the similarity of Criteria 3 and 4 with the baseline scenarios and the respect of the technology neutrality principle:** the thresholds proposed by BEREC for Criteria 3 and 4 are so stringent that today they could not even be met by the fibre networks considered in the baseline scenario. Criteria 3 and 4, as presently defined, would unduly limit telco operators in their freedom of selecting the most appropriate technologies, failing to ensure the technology neutrality principle. Contrary to the intentions, the guidelines risk slowing down the achievement of the Gigabit society targets and/or entailing higher investments for operators, without any additional benefit for final users. A more accurate definition of parameters and collection of data from operators is also needed to ensure the setting of similar performances in Criteria 3 and 4.

3. **Ensure a consistent application of Criteria 3 and 4:** the draft BEREC guidelines seem to suggest that the respect of the proposed criteria will be assessed by NRAs through speed (for fixed) or drive (for wireless) tests, while the thresholds proposed by BEREC are only theoretically achievable (see point 38) and could not be actually achieved and, therefore, measured. If the thresholds refer to achievable performance, then the respect of Criteria 3 and 4 shall be assessed on the basis of the theoretical achievable performances declared by operators.

TIM's reply focuses on the abovementioned points.

1) Need to consider throughput instead of data rate

Criteria 3 and 4 of the draft BEREC guidelines restrict, unreasonably and in contrast with the EECC, the choices of telco operators when they provide “speed” specification in terms of “data rate” instead of “bandwidth”. While the explanation provided is merely formal (see footnote 11, page 15) – i.e. avoidance of possible confusion with spectrum extent in case of wireless networks – the effect is indeed substantial.

The EECC refers to “bandwidth” parameters and not to data rates assuming the point of view of the customer, who with the term “bandwidth” is interested in the Internet “speed”, so implicitly referring to the end-to-end throughput.

At recital 13 the EECC confirms that *“while in the past the focus was mainly on growing bandwidth available overall and to each individual user, other parameters such as latency, availability and reliability are becoming increasingly important.”* In an ultra-fast BB context, latency and packet loss are relevant because each of them may cause throughput degradation, whereas in a BB context the throughput is always equal to the data rate (as those parameters are not relevant). This is the reason why addressing “data rate” as if it were equivalent to Internet speed (i.e. “bandwidth” at the end user’s eyes) is misleading and could turn out in bad performance and increased roll-out cost.

The draft BEREC guidelines at point 13 state that *“Very high capacity networks are of importance since they are capable of providing end-user services with a particularly high quality of service (QoS). The EECC promotes the rollout of very high capacity networks to benefit end-users (Art. 3(2)a EECC). Therefore, the equivalent performance of the baseline scenario (see paragraphs 9, 12c and 12d) is considered with regards to the achievable end-user QoS of very high capacity networks.”*

Furthermore, according to ITU, QoS is the *“totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service”*¹.

Therefore, **network performance should be considered in its entirety as a function of different characteristics and parameters affecting QoS and this is commonly represented through the throughput.**

Focusing on data rate through the imposition of very high downlink/uplink performance (as in the current BEREC proposal) does not comply with the EECC requirements, which do not ask for an isolated assessment of each parameter, nor for the assessment of data rate. Data rate is not representative of the end-to-end QoS experienced by the end user, which instead actually depends on the application throughput.

Therefore, in order to better reflect the end-user QoS, BEREC should stick to the definition of “bandwidth” in the spirit of the EECC and assume in Criteria 3 and 4 appropriate thresholds for the **throughput**, so concurrently considering the data rates, the packet loss ratio (PLR) and the latency expressed through the round-trip packet delay (RTD).

A certain level of throughput could be delivered with different combinations of downlink/uplink data rates, PLR and RTD values. Therefore, **separately imposing the fulfilment of each performance threshold listed in Criterion 3 significantly restricts possible alternative implementations** which could

¹ ITU-T P.10/G.100

provide a throughput equivalent to the baseline scenario networks. This outcome would finally hamper the principle of technology neutrality enshrined in article 2(2) of the EECC since focusing on data rates alone would disincentivise some technical configuration of networks capable of providing to end users the same overall performance and QoS as the baseline scenario.

Moreover, since the relative costs of modifying the different parameters to obtain the same throughput are different, the configurations that would be inhibited by not looking at throughput (but at data rate only) might well turn out to be less expensive. This outcome would negatively affect the development of VHCN, against the EECC and Gigabit society objectives.

Therefore, **the throughput should be considered as a new parameter**, putting together the different performance thresholds in a consistent way. A throughput-based threshold would allow operators a greater flexibility in deciding how to efficiently reach a certain network performance, also in the light of network costs and national specificities.

As a mere example, if we consider the present thresholds currently defined for Criterion 3 (which, as better explained below, should be modified to be realistically met also by networks satisfying Criterion 1), the end user would experience a throughput of about 200 Mbps². Should an operator build an infrastructure capable of providing a similar, equivalent or even better throughput for the end user by improving PLR and RTD against a lower downlink data rate target, this network should be considered similar and thus qualified as VHCN.

This holistic interpretation would be much more respondent to both the overall EECC objective of promoting VHCN and the technological neutrality principle.

Moreover, considering a given network performance, in terms of throughput and end user experience, a certain degree of flexibility on the functional parameters - and thus on the overall cost efficiency of end user experience - should be taken into utmost consideration especially in the light of the Covid-19 pandemic and the consequent economic crisis.³

In this context the development of VHCNs capable of enhancing end user QoS and experience is even more paramount than before, as social distancing and the use of digital tools for work and education will be essential, both in urban and rural areas. Current BEREC's approach looking at the maximum achievable performance could discourage telco operators from investing, when and where, on the contrary, this is urgently needed. For example, some architectures including edge-cloud computing could rapidly enhance performance of networks and should be encouraged in the guidelines.

The guidelines should be revised in search of “efficient” network solutions that allow telco operators to plan investments in the best way to achieve QoS targets and safeguard the investments already incurred. For example, investments in the rights of use of frequencies for 5G should be duly considered, also in light of the EC Gigabit Society Communication, while for FWA solutions the draft BEREC guidelines do not exclude, as they should, the use of not licensed frequencies.

² Considering the correct values for the indicators of the throughput formula, the throughput threshold in the final guidelines should be lower than 200 Mbps.

³ The EU Electronic Communication sector is facing, in the best-case scenario, a 2-year delay in the growth. According to an Analysys Mason study (April 2020), “COVID-19 will lead telecoms revenue to decline by 3.4% in developed markets in 2020”, and “overall revenue declines are expected to amount to 3.4% in 2020 (against a previous forecast of an increase of 0.7%) with a modest rebound of 0.8% in 2021”.

2) Need to ensure the similarity of Criteria 3 and 4 with the baseline scenarios and the respect of the technology neutrality principle

2.1. Similarity and technology neutrality principle

According to the EECC, in order to be qualified as VHCN, a network shall either respect a **qualitative** criterion (being constituted of fibre) or a **quantitative** criterion concerning network performance which should be similar to the performance **under usual peak-time conditions** of a network meeting the qualitative criterion.

Instead, **the values proposed by BEREC seem to reflect more the maximum achievable performances** than the performances which could be delivered **under usual peak time conditions**, as requested by the EECC. This could be due to a different interpretation of peak time conditions by the operators that responded to the questionnaires.

The QoS thresholds proposed in Criteria 3 and 4 are overestimated and inconsistent, with the paradox that they could not be met even by today's networks constituted of optical fibre up to the distribution point (for fixed) and up to the base station (for wireless), which by default meet respectively the Criteria 1 and 2. Indeed, data rate on fibre networks could drop during peak time well below the 1 Gbps target proposed in the present draft VHCN Guidelines⁴.

The result will be that only the technologies satisfying the Criteria 1 or 2 will be qualified respectively as fixed and wireless VHCN, although they do not necessarily meet respectively Criteria 3 and 4.

For an optical fibre access, failing to respect Criterion 3, however defined (and similarly for a wireless network with fibre up to the base station failing to respect Criterion 4), would inevitably **violate the principle of technology neutrality**, while according to EECC Recital 13 “[i]n accordance with the principle of technology neutrality, other technologies and transmission media should not be excluded, where they compare with that baseline scenario in terms of their capabilities.”

Criteria 3 and 4 proposed by BEREC include performance thresholds more demanding than the performances achievable under the baseline scenario, instead of similar performances. This is clearly not compliant with Article 2(2) of the EECC, which prescribes that “*an electronic communications network [other than an optical fiber network] should be capable of delivering, under usual peak-time conditions, **similar** [emphasis added, ndr] network performance in terms of available downlink and uplink bandwidth, resilience, error-related parameters, and latency and its variation*”.

To be considered “*similar*” in the spirit of the EECC, any fibre network must meet Criterion 3 and any wireless technology with fibre up to the base station must meet Criterion 4. In this respect, point 17.b (and similarly point 17.d) is conceptually wrong when it affirms that “*a network which qualifies as a very high capacity network according to criterion 1 does not necessarily fulfil criterion 3*”.

Indeed, in accordance with the technology neutrality principle, the similarity of the performance should be reasonably interpreted as “getting close to”. It is **not reasonable** to set such parameters thresholds in order to have more performative networks than the FTTH/B ones. The reasonable relationship should be for Criterion 3 somehow:

⁴ See, e.g., Hernández, J. A. et al., “Oversubscription dimensioning of next-generation PONs with different service levels.” IEEE Communications Letters, 2016, pp. 1341-1344.

Performance FTTB networks \approx Performance other VHCNs $>$ performance threshold as for Criterion 3.

Only a correct definition of Criterion 3 could ensure the respect of the technology neutrality principle and allow the VHCN qualification of efficient network solutions different from FTTH/B. Indeed, especially in the presence of short (pre-existing) lines to the customer premise equipment, a **similar QoS** could be delivered to end users even if the fibre does not reach a single multi-dwelling building but a more central point in the access network. As well, also FWA networks on licenced frequencies could be qualified as fixed VHCN.

The same applies for wireless connections, indeed as Criterion 4 stands in the current BEREC's proposal, only wireless connections with fibre up to the base station would be qualified as VHCN according to Criterion 2, while other efficient solutions, such as wireless connections with radio links in backhaul, risk of being excluded according to Criterion 4.

2.2. Data rates thresholds and the inconsistency with the Gigabit society objectives

The downlink/uplink data rates thresholds should be substantially lowered also in the light of the European Gigabit Society objectives.

Connectivity objectives at 2025, as defined by the EC communication towards the European Gigabit Society, have been at the basis of the EECC provisions and should be considered as a reference for the definition of VHCN.

As for Criterion 3, the proposed value of 1.000 Mbps downlink cannot be intended as a minimum threshold to be qualified as VHCN, given that the Gigabit society Communication sets 1 Gbps as a data rate objective at 2025 just for socio-economic drivers, while it sets a minimum threshold at 100 Mbps downlink (upgradable overtime to 1 Gbps) for households.

In order to ensure an alignment with the objectives of the Gigabit society, the threshold for the downlink data rate should be set closer to 100 Mbps instead of 1 Gbps.

The Gigabit Society Communication itself states in the glossary (page 55) of the Staff Working Document that “VHC - Very high-capacity networks are networks with best-in-class performance in terms of speed (i.e. significantly **above 100**)”.

This is also consistent with the periodicity of VHCN guidelines revision. As a matter of fact, BEREC is called by the EECC to revise its guidelines by 2025, when Gigabit Society targets are due and should be a much adherent reference for BEREC guidelines. Moreover, BEREC is called by the EECC to regularly update the VHCN guidelines, which does not explicitly happen for most guidelines. This means that the EECC is pursuing a gradual update of the VHCN concept. Therefore, BEREC guidelines should be very well grounded on the current market and technological context and 2025 Gigabit society targets.

2.3. IP packet loss ratio and Round trip IP packet delay

BEREC states at point 43 that “Today, nearly all communications networks are based on the Internet Protocol (IP). Therefore, the QoS parameters of the performance thresholds 1 and 2 are based on IP” and clarifies at point 44 that the VHCN definition is not limited to the access network, but it encompasses the **entire network**.

Indeed, both PLR and RTD do not only depend on the access network but on the end-to-end connection, being mostly influenced by the Internet conditions and by telco operators' transport network.

Anyhow, at point 52 BEREC states the opposite by claiming that *“The performance thresholds 1 and 2 focus more on the access network since core networks are usually based on fibre”*.

This assumption makes it impossible to meet the thresholds which have been set at a very low value (too stringent) – $PLR \leq 0.0025\%$ and $\leq 0.0050\%$, respectively for Criteria 3 and 4 - while the end-to-end values which could be realistically measured and delivered to end users by the networks of the baseline scenarios are significantly higher (one order of magnitude or more).

The low values proposed by BEREC cannot be met by any networks, even if entirely in fibre, since PLR and RTD are mostly independent from the access network.

Moreover, we do not consider ITU-T Recommendation Y.1540 to be the appropriate reference, since this parameter is focused on *“end-to-end IP service”* which entails *“end hosts as specified by their complete IP addresses”* and it is not representative of the end-to-end service. Indeed, links are terminated at points where IP packets are forwarded (i.e. routers), which in today’s telecommunication networks are located at the core node level (interface with the Big Internet) very far from the distribution point.

The same error is made for the definitions of packet round-trip delay and packet delay variation, respectively based on RFC 2681 and RFC 3393. Quoting from RFC 2681, the document concerns with *“round-trip delay of packets across Internet paths”*.

Instead, as clearly explained by BEREC in its Guidelines detailing Quality of Service Parameters (BoR (20) 53), QoS *“concerns the network and terminal equipment up to the user interface”*⁵.

To ensure the consistency with the EECC Annex X and across different BEREC guidelines, the Latency (delay), the Delay variation (jitter) and the Packet Loss Ratio definitions should be aligned to the ones provided in BoR (20) 53, “Table 1A - IAS QoS Parameters as set out in Annex X of the EECC” (see page 13).

2.4. Methodological errors and absence of a clear definition of parameters

It is worth noting that the definition by BEREC of too stringent QoS values in Criteria 3 and 4 has been also biased by:

- **Methodological errors:** erroneous choice of the statistical sample, with the consequence that none of the respondents to the questionnaire meets Criterion 3 (for fixed networks) and Criterion 4 (for wireless networks);
- **The absence of a clear definition of parameters:** uncertainty on the perimeter of KPIs (the access network or the entire end-to-end network) especially for some parameters (e.g. IP packet error ratio and IP packet loss ratio) and on the definition of peak time conditions.

As for **Criterion 3**, as explained in Annex 2, BEREC values for fixed networks are based on the data provided by (see Table 1 of the draft BEREC guidelines)⁶:

- **8 operators** for Fixed network with fibre to the multi-dwelling building and G.fast on the in-building copper twisted pair;

⁵ For QoS definition, see also figure 1, page 6, BoR(20)53

⁶ Data for fixed networks with fibre to the multi-dwelling building and Ethernet on the in-building twisted pair cable of category 5 or higher have been excluded since they are not very common (see point 233).

- **19 operators** for Hybrid fibre coax (HFC) network with fibre rolled out up to the multi-dwelling building and DOCSIS 3.0 on the in-building coax network.

As shown in Table 2 of the draft guidelines, **no data have been considered for Italy and other large EU Countries** (e.g. France and Spain), while other Countries are represented with numerous questionnaires (e.g. Denmark with 7 questionnaires, Latvia with 7, Finland with 5). Therefore, results may be largely biased.

BEREC further reduces the use of data on fixed networks with fibre to the multi-dwelling building and G.fast on the in-building copper twisted pair since **it considers only 4 out of 8 data for the data rates** parameters, on the ground that only G.fast with 212 MHz was to be considered, with maximum possible bandwidth (from 2,2 MHz), so having no regard to compatibility with existing services (see point 131).

Furthermore, only very few of these 4 operators provided data for the other QoS parameters (see point 157), with the consequence that **the statistical sample is not the same for each parameter**.

The result of this arbitrary selection of data is that **some technologies (which should have been considered in the baseline scenario) and several EU Countries are not represented in the sample used by BEREC**.

Therefore, **the thresholds set by BEREC cannot be met overall by any network of the baseline scenario**.

In addition, it is worth noting that BEREC requested the values of parameters both for already deployed networks and for pilots or field trials, whereas these latter should be of lower relevance considering that they regard a small number of lines.

BEREC should consider the same sample for each parameter and each EU Country should be represented.

The fact that some QoS parameters were not provided by many operators should be carefully assessed. Where values for a parameter were not provided by the majority of respondents, this may mean that it is not the right parameter to consider.

Also the definition of **Criterion 4** is affected by the same methodological errors as Criterion 3 and the representativeness and consistency of the statistical sample shall be improved.

Indeed, as shown in Table 3 of the draft guidelines, BEREC considers only the data provided by **20 operators from 13 EU Countries** out of 32 operators from 19 Countries which had provided data. As before, Italy and some other large EU Countries (e.g. Germany) have not been represented, while for some Countries (e.g. Denmark and Slovenia) even data from three operators are considered. Therefore, for Criterion 4 results may be largely biased as well.

In addition, for Criterion 4 BEREC arbitrarily chose to set performance thresholds at the 90° percentile, instead of using the median. This clearly entails that even the technologies of the baseline scenario (fulfilling Criterion 2) do not fulfill Criterion 4, as also recognized by BEREC at points 17c and 36: *“Therefore, in practice, save for exceptional cases of LTE Advanced (4G), BEREC expects that **4G and earlier generations of mobile networks are not able to meet performance thresholds 2**.”*. In addition, this is even more in contrast with the decision of not limiting the use of technologies on unlicensed frequencies that provide poor performance in the presence of interference.

Besides the above issue related to the representativeness of the statistical sample, we believe BEREC may have collected non-comparable data from operators due to the absence of a clear definition of parameters.

The fact that BEREC did not provide a definition of peak time conditions might have led to different interpretation by operators responding to the questionnaires.

Moreover, different operators may have referred to different parameters.

In particular, for the data rate the questionnaire requested the *“data rate of the IP packet payload or otherwise specify the OSI layer to which the data rate refers to and whether it refers to payload or gross bitrate”*.

BEREC also claimed that *“In case values cannot be provided for a certain QoS parameter, please provide values for a comparable QoS parameter”*.

As a consequence, BEREC may have collected non-comparable data from operators.

3) Need to ensure a consistent application of Criteria 3 and 4

Section 5 of the draft BEREC guidelines includes, in our view, other inconsistencies.

On the one hand BEREC states at point 67 (and similarly at point 73 for Criterion 4) that for meeting Criterion 3 *“it is sufficient that the network is capable to provide a service which meets the performance thresholds 1. Therefore, it is neither necessary that the network actually offers such a service nor that all services provided by the network have to meet the performance thresholds 1”*. On the other hand, it requires at point 69 (and similarly at point 75 for Criterion 4) that *“under usual peak-time conditions, the end-users in this sub-area will typically experience at least the QoS of the performance thresholds 1 at the point where the subscriber access line ends in its living space”*.

BEREC even mentions the use of speed test for measuring the QoS of fixed networks (see point 69) and the use of drive test for measuring the QoS of wireless networks (see point 75).

This is clearly inconsistent with the fact that the thresholds 1 and 2 refer to (theoretically) achievable QoS parameters and not to the achieved ones.

For example, the data rates measured by AGCom for mobile networks are significantly lower than the ones proposed in Criterion 4 by BEREC (see Table 1 below).

Table 1: Comparison between BEREC threshold 2 and AGCom’s measurement

	BEREC	AGCom 2019
a. Downlink data rate	≥ 150 Mbps	65 Mbps
b. Uplink data rate	≥ 50 Mbps	29 Mbps

Source: TIM’s elaborations based on AGCom “Misura internet mobile 2019”

For mobile networks, the QoS measurement is affected by several factors beyond the radio technology used, such as: type of device, end user’s position in the radio cell, number of simultaneous users, device’s mobility. Therefore, the measurement results could be significantly lower than the theoretical maximum achievable values.

If the respect of the BEREC criteria shall be assessed through measurements, also the definition of the thresholds shall reflect QoS which could be actually achieved and measured or **if the thresholds refer to achievable performance, then the respect of Criteria 3 and 4 shall be assessed on the basis of the theoretical achievable performances declared by operators.**

Although less critical than for mobile networks, the same concept applies to threshold values for fixed networks, since the traffic conditions may affect the measurement results.