

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

Introduction

This document provides a response to the public consultation on the Draft BEREC Guidelines on Very High Capacity Networks (March 5th, 2020). The document follows the structure of the draft BEREC guidelines and provides detailed comments per section where applicable.

This is a preliminary assessment mainly based on analysis by experts working for the European Commission on a broadband mapping project (Javier Aracil, Ljiljana Simić, Petri Mähönen). It is being submitted after consultation with the BCO Network and written contributions, comments or explicit endorsement from a few network members with other submitting individual replies directly to BEREC.

(Section 2) Definition of the term ‘very high capacity network’ in the EECC

Recital (7) - ‘(Recital 13 article 2(2) EECC) [...] 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. The current response towards that demand is to bring optical fibre closer and closer to the user, and future ‘very high capacity networks’ require performance parameters which are equivalent to those that a network based on optical fibre elements at least up to the distribution point at the serving location can deliver.

*In the case of **fixed-line connection**, this corresponds to network performance equivalent to that achievable by an **optical fibre installation up to a multi-dwelling building**, considered to be the serving location.*

*In the case of **wireless connection**, this corresponds to network performance similar to that achievable based on an **optical fibre installation up to the base station**, considered to be the serving location.*

In the case of fixed-line connection, we believe that fiber should actually reach the apartment itself in case of a multi-dwelling building. If not, the bottleneck may be in the very last hundred meters, thus defeating the purpose of the optical fiber. However, we agree that the last hundred meters are within private land and should be taken care of by the property. However, given this limitation/uncertainty about VHCN fixed, criterion 1 should have also a QOS criteria attached to clarify what is expected in terms of performance.

As for wireless connection, the cell load matters even more than the fact that the fiber reaches a base station, as will be detailed later.

Variations in end-users' experience which are due to the different characteristics of the medium by which the network ultimately connects with the network termination point should not be taken into account for the purposes of establishing whether a wireless network could be considered as providing similar network performance.

We emphasize that such “different characteristics” of the wireless medium (propagation, load) are key to the network performance achieved, as well as the spectrum allocation. We believe that additional conditions must be met in order for a wireless connection to be considered as VHCN.

Recital (12,d) - *Any network which provides a wireless connection and is capable of delivering under usual peak-time conditions a network performance equivalent to what is achievable by a network providing a wireless connection with fibre roll out up to the base station (performance thresholds 2).*

It may very well happen that due to cell load and channel propagation conditions the end-user receives less than basic broadband access, and certainly less than the performance thresholds 2, if the above definition is adopted. We believe this is completely against the purpose and intention of the EECC of providing end-users with very high Quality of Service (QoS) with VHCN, beyond current basic broadband capabilities.

We also note that such criterion is not unambiguous to apply. The performance that can be provided by base stations that are fiber optic terminated can still have very large differences due to technology and the environment where they operate. Thus if the regulator or the state aid organisation had to make such a performance comparison between non-fiber-optic part of the network and fiber-optic-terminated network, it is not clear against which performance parameters, or even against what kind of fiber-optic-terminated base stations, such a comparison should be made. There is a danger here that not enough guidance is given, and the ambiguity would lead to highly different, or even random comparisons. In other words, the ambiguity of the wireless VHCN definition in the guidelines risks that its application by different entities may result in an almost arbitrary classification of wireless networks as “VHCN”, making meaningful comparison difficult if not impossible.

(Section 3) Criteria for the definition of ‘very high capacity networks’

Recital (16) - *In accordance with the EECC (see section 2) and based on data collected from network operators (see section 4 and annex 2 to 4), BEREC has determined that any network which fulfils one (or more) of the following four criteria is a very high capacity network:*

Criterion 1: *Any network providing a fixed-line connection with a fibre roll out at least up to the multi-dwelling building.*

Criterion 2: *Any network providing a wireless connection with a fibre roll out up to the base station.*

Criterion 3: *Any network providing a fixed-line connection which is capable of delivering, under usual peak-time conditions, services to end-users with the following quality of service (performance thresholds 1):*

- a. *Downlink data rate ≥ 1000 Mbps*
- b. *Uplink data rate ≥ 200 Mbps*
- c. *IP packet error ratio (Y.1540) $\leq 0.05\%$*

- d. IP packet loss ratio (Y.1540) $\leq 0.0025\%$
- e. Round-trip IP packet delay (RFC 2681) $\leq 10\text{ ms}$ ¹
- f. IP packet delay variation (RFC 3393) $\leq 2\text{ ms}$
- g. IP service availability (Y.1540) $\geq 99.9\%$ per year

Criterion 4: Any network providing a wireless connection which is capable of delivering, under usual peak-time conditions, services to end-users with the following quality of service (**performance thresholds 2**).

- a. Downlink data rate $\geq 150\text{ Mbps}$
- b. Uplink data rate $\geq 50\text{ Mbps}$
- c. IP packet error ratio (Y.1540) $\leq 0.01\%$
- d. IP packet loss ratio (Y.1540) $\leq 0.005\%$
- e. Round-trip IP packet delay (RFC 2681) $\leq 25\text{ ms}$
- f. IP packet delay variation (RFC 3393) $\leq 6\text{ ms}$
- g. IP service availability (Y.1540) $\geq 99.81\%$ per year

Recital (17) - Note to criterion 1 and criterion 2 a. Criterion 1 and criterion 2 result from the EECC (see section 2).⁶

- a. Criterion 1 and criterion 2 result from the EECC (see section 2).
- b. Note that a network which qualifies as a very high capacity network according to criterion 1 does not necessarily fulfil criterion 3.
- c. Note that a network which qualifies as a very high capacity network according to criterion 2 does not necessarily fulfil criterion 4.

The EECC defines a VHCN network (Art.2 (2)) as a network in which the fiber reaches the “distribution point at the serving location” or a network with similar network performance, that could be estimated according to the baseline scenarios included in Recital (13), where the “distribution point at the service location” for fixed and wireless networks is further specified. In other words, the EECC establishes an architecture that VHC networks must have and, from here, an equivalent performance criterion to respect the principle of technological neutrality.

Turning over the argument to say that once this correspondence between architecture and performance has been established, the original criterion of architecture can be autonomous and not meet the performance criterion, is simply to misinterpret the EECC and go against its spirit. And this is exactly what is established in these draft VHCN guidelines, as expressed in its paragraphs 17 (b) and (c), where it is stated that the networks that served as a reference to define performance criteria, namely, networks with fiber rolled out to the distribution point for fixed and wireless networks, may themselves not meet this criterion, which does not make logical sense.

As previously stated, this constitutes a clear misinterpretation of the EECC that can lead to serious inconsistencies when it comes to its application, given that, by following these indications, an NRA could categorise 3G networks with base stations connected to a fibre optic backhaul or VDSL networks with copper sections in poor condition as VHCN, even though they do not meet the equivalent performance criteria. This not only breaches the

¹ It should be stressed that an additional 1 ms is added per 100 km.

EECC for the reason stated above, but can have serious consequences in its application, leading to wrongly applying all the precepts that take into account whether a network is a VNCN.

In order to correct this serious logical error in the draft guidelines, it is proposed that criteria 1 and 2 of the guidelines be removed, leaving only the *performance* criteria, that is, criteria 3 and 4 for fixed and wireless (mobile) networks respectively. Alternatively, criteria 3 and 4 performance parameters could be added to criteria 1 and 2 respectively. The determination of these performance criteria of the VHCN networks are also adjusted to the scope that these guidelines should have according to Article 82 of the EECC, which specifies that BEREC should issue guidelines on the criteria in terms of performance parameters.

Recital (18) - Note to criterion 3 and criterion 4 a. For the qualification as a very high capacity network, it is sufficient that a network is capable to provide a service which meets the performance thresholds 1 in case of fixed-line connection or performance thresholds 2 in case of wireless connection. 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 or performance thresholds 2.

The wording of Recital 18 has the potential to be extremely problematic in the context of broadband mapping. It is not clear what the purpose of the distinction between “achieved” and “achievable” network performance is; moreover, making this distinction in the very definition of VHCN makes it very easy for network operators to report that their deployed networks are VHCN while not in fact delivering the corresponding levels of performance, potentially giving a very distorted picture of EU’s broadband capabilities such that any broadband mapping exercise using this definition of VHCN would be rendered utterly ineffective for key policy and decision making purposes.

Recital (20) - A ‘wireless very high capacity network’ (i.e. a network that meets criteria 2 or 4, or both), may also meet the performance thresholds of criterion 3 and, if this is the case, it may be considered equivalent to a ‘fixed very high capacity network’. This may apply in particular to wireless networks providing services that compete in the same market with services provided by fixed networks (such networks and services are often marketed under the term ‘Fixed Wireless Access’ or ‘FWA’).

There are many factors that affect the performance of wireless networks, not only shared access for users, but also the radio access characteristics, which are highly dependent on the conditions of wireless propagation. The radio conditions necessary to meet the minimum performance levels should be known (e.g. line-of-sight required, fresnel zone cleared, ...) in order to determine in what baseline conditions these networks could be considered as fixed VHCN.

(Section 4) Determination of the performance thresholds 1 and 2

On the methodology followed to determine the performance thresholds

The methodology followed by BEREC to determine performance thresholds for a VHCN is based on a benchmarking analysis from a network operator (NO) survey of what end-user QoS can be achieved in its fiber-based network for the multi-dwelling building (in the case of fixed networks) / base station (in the case of mobile networks) (paragraph 100 of the guidelines).

However, we believe that the purpose and intention of the VHCN definition in EECC is to define an *ambition* for the level of broadband provisioning consistent with EU broadband targets for 2025, 1 Gigabit symmetrical and 5G, where the NRA/OCA would subsequently monitor the actual performance of deployed and planned networks in EU member states against these targets.

In particular in the case of wireless VHCN, BEREC's approach of instead asking MNOs what they can provide *now* using 4G networks and then using those numbers to define the performance thresholds that constitute the "standard of excellence" that the MNOs will subsequently be measured against, means that the wireless networks deployed in the EU will readily fulfil the VHCN criteria *by definition*, because this definition is circular in coming from the MNOs own statements of what they can already now deliver, rather than a policy-based performance target.

We believe this approach is thus at best a logical fallacy, and at worst a serious failure of NRA/OCAs to fulfil their regulatory role in properly monitoring MNOs and quantifying the extent to which EU wireless networks are VHCN in real terms, i.e. in the context of development goals.

In particular as regards to EU targets on 5G connectivity, the best way to take 5G into account is to establish more ambitious performance thresholds that encourage the development of these networks. Strong support from these networks, identifying them clearly as VHCN networks as opposed to current networks, would accelerate their deployment in the near future.

On the technical conditions of the performance criteria

Recital (37) - The performance thresholds 1 and 2 have to be determined 'under usual peak-time conditions' (see paragraph 14). Therefore, realistic conditions prevailing in networks which correctly reflect end-user experiences need to be considered. For this reason, the determination of the performance thresholds 1 and 2 focus on the service with the highest end-user QoS, a typical use of the network and the current service portfolio. This implies that several end-users simultaneously use the network during peak-time.

There is no clear definition of "usual peak-time conditions" in the document, which would be necessary to in turn make unambiguous the definition of the performance thresholds 1/2. Nowadays, all networks are based on the principle of statistical multiplexing gain and the oversubscription factor is a key parameter. The very same network infrastructure can provide very different QoS levels to the end users depending on how many users are being multiplexed in bottleneck links and what their nominal speeds are. Precisely, QoS depends on the number of users concurrently active (which increases during "peak-time conditions"). Therefore, it is imperative to define what "peak-time conditions" mean in very clear terms.

Recital (38) - *Since the performance thresholds 1 and 2 need to be based on the achievable (and not currently achieved) end-user QoS (see paragraph 14), they are determined based on the service with the highest end-user QoS (data rate) possible with the ‘best’ technology deployed in the network.100.b, 100.f and 104.d). ¹⁰This is a hypothetical situation and it is assumed that the subscribers which are currently subscribed to the service with the highest data rate get the service with the highest data rate possible instead (see paragraphs 100.b, 100.f and 104.d).*

The above paragraph gives ample room for any QoS level - “achievable” but not “achieved”, “highest end-user QoS (data rate) possible”. There is no minimum QoS level being guaranteed at all, just a vague promise of “achievable” QoS, which, in practice, means nothing.

Recital (40) - *The EECC does not define the situation for which performance thresholds 1 and 2 need to be determined in more detail. Therefore, it is not possible to determine performance thresholds 1 and 2 for a more specific situation.*

The objective of these guidelines is to provide guidance to NRAs on the criteria that a network is to fulfil in order to be considered a VHCN, so if we don’t define specific situations in which to apply performance thresholds 1 and 2, it is impossible to establish specific criteria to decide if an electronic communication network is VHCN or not, and under what conditions. Defining specific situations (e.g. traffic profile, number of users who share the medium, length of the access media, life cycle of the cables,...) allows determining under which conditions the behaviour of electronic communication networks is measured according to established thresholds, and also allows us to decide under what conditions those networks can be considered VHCN.

(Section 5) Application of the criteria 1 to 4

Recital (61) - *BEREC is of the view, that in case fibre is rolled out up to the multi-dwelling building it is desirable that technologies which are deployed inside the building correspond to the performance potential of FTTB, although this is not a legal requirement (see paragraphs 16 and 59).*

Once again, it is not sufficient to “desire”. In order not to fall into gross inconsistencies, such as a network classified as VHCN providing only basic broadband access, some reasonable minimal performance bounds should be enforced irrespective of the type of media also for the last hundred meters.

Recital (65) - *BEREC is of the view, that in case fibre is rolled out up to the base station it is desirable that wireless access technologies which are deployed correspond to the performance potential of fibre to the base station, although this is not a legal requirement (see paragraphs 16 and 63).*

In line with the previous comment, it is not enough to “desire”, minimum requirements must be established based on the objectives of the Gigabit Society, in particular those related to high performance 5G connectivity, in order to avoid inconsistencies and to give a real boost to these networks.

Recital (69) - *A sub-area meets performance thresholds 1, if, 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 (not including limitations from the customer premises equipment). For example, if end-users in this sub-area would measure the data rate of the service with an internet speed test during peak-time, then*

they would typically measure at least 1,000 Mbps in downlink and 200 Mbps in uplink (at the level of the IP packet payload) in case their customer premises equipment does not limit the data rate.

The former clearly refers to Wi-Fi inside the household, which is fine, but again lacks precision. First, what is exactly peak-time? Is that “anytime”? Second, what is an Internet speed test? There are a number of standards that define “speed tests” (ETSI, etc), which can be used for the sake of preciseness.

Recital (74) - The area covered by the network which provides a wireless connection needs to be divided in appropriate sub-areas (e.g. coverage area of a base station or group of base stations). For each sub-area, it needs to be determined whether the performance thresholds 2 are met². If a sub-area meets performance thresholds 2, then the part of the network that covers this sub-area qualifies as a very high capacity network.

The phrasing “appropriate sub-areas (e.g. coverage area of base station or group of base stations)” is far too ambiguous, as it can span the range of a femto-cell to a group of macro-cells, corresponding to a sub-area size of few square meters to several square kilometers. Importantly, this vague definition of per-sub-area VHCN classification for wireless networks is likely to **undermine and cause conflict with the granularity of geographic grids required for EU broadband mapping**. Moreover, there is no mention or notion of cell load (or population/user density) with respect to the sub-area size - this adds to the risk of MNOs reporting **highly variable and not readily comparable** declarations of VHCN classification for the geographic areas covered by their respective wireless networks.

Recital (75) - A sub-area meets performance thresholds 2, if, under usual peak-time conditions, in this sub-area an end-user will experience on average at least the QoS of the performance thresholds at outdoor locations. For example, if the data rate in this sub-area will be measured during peak-time with a drive test, then the average value of the measured data rate would beat least 150 Mbps in downlink and 50Mbps in uplink (at the level of the IP packet payload) in case the mobile equipment used in the drive test sufficiently supports the technology used in the wireless network.

According to this, the sub-area of the wireless network is considered to be VHCN if the performance of the **average** user in the sub-area meets the performance thresholds 2; this means that it is possible that **50% or more² of the users in that network sub-area have performance under the VHCN threshold** and the sub-area will still be classified as a wireless VHCN. This is particularly problematic given the wide range of sub-area sizes (and corresponding user numbers) that Recital 74 allows, as noted above.

We also note that by mentioning “drive tests”, Recital 75 implies that the verification of whether the VHCN thresholds are met would be done via QoS-2 field measurement tests. This definition has implications, and a potential for conflict, with EU broadband mapping guidelines which primarily rely on QoS1-based theoretical calculations/estimates of broadband reach mapping. While verification of the performance of selected sampled parts of the network via QoS-2/3 measurements is to be encouraged in general, we emphasize here the **potential for conflict with EU broadband mapping guidelines which reply on the VHCN classification in the present BEREC document**; we urge a careful definition of VHCN which does not cause foreseeable conflicts with or unintentionally force an inappropriate methodology for EU broadband mapping.

² Depending on whether “average” is taken to be the median or mean.

Recital (74, Footnote 22) - *In case the network operator does not (yet) offer a service which meets performance thresholds 2, then the proof whether performance thresholds 2 are met may be based e.g. on measurements with test implementations in the network.*"

Similarly, Footnote 22 may conflict and unintentionally preempt the methodology of EU broadband mapping with respect to **forecasts**; the wording here must be very carefully thought out, since e.g. a test lab setup of 5G/6G massive-MIMO systems can easily show impressive *link* performance which will not translate in the same level of representative *network-wide* performance.

Relationship with previous BEREC documents

There appears to be some inconsistency between the present draft BEREC guidelines (BoR (20) 47) and previous documents of BEREC, especially Guidelines BoR(16)127 and Methodology BoR (17)178.

In connection to VHCN and requested QoS, the current BEREC guidelines mention two categories of connection: i) Fixed - line and ii) Wireless, while Guidelines BoR(16)127 and Methodology BoR (17)178 mention two categories of networks for IAS (Internet Access Service): i) Fixed - (BoR(16)127 – i.e. Pg.34), (BoR(17)178 – i.e. Chapter 6.2), and ii) Mobile - (BoR(16)127 – i.e. Pg.35), (BoR(17)178 – i.e. Chapter 6.2)

Thus, an interpretation can be made (according to the current BEREC guidelines) that radio links of type FWA or WAS are not part of the fixed network (providing access at fixed location). Instead, radio links of type FWA or WAS would be part of the mobile network (providing mobile access).

Furthermore, according to the BoR Guidelines (16) 127 and the BoR Methodology (17) 178, the following types of speeds are defined for each type of network which are crucial for QoS and which must be defined and bound by the ISP (Internet Service Provider) towards the end-user:

a) Fixed networks - minimum, normally available, maximum and advertised download and upload speed (Methodology BoR(17)178 Article 6.2). To assess the performance of these networks, Normally Available Speed is essential throughout its definition (Methodology BoR(17)178 Article 6.2.3 and Instructions BoR(16)127 §147 - 149).

b) Mobile networks - estimated maximum and advertised download and upload speed (Methodology BoR(17)178 Article 6.2). To assess the performance of these networks, Estimated Maximum Speed is essential throughout its definition (Methodology BoR(17)178 Article 6.2.2 and Instructions BoR(16)127 §153 - 155).

Moreover, to determine a type of a network, parameter values of QoS available to the end-user (at the Network Terminal Point – NTP) are essential and fully in line with the BEREC Methodology, not values of parameters of QoS which can be achieved/are achievable by the ISP as stated in the current guidelines.