Brussels, April 30, 2020

GIGAEurope response to BEREC public consultation on draft BEREC guidelines on VHCN (BoR(20))

GIGAEurope welcomes the opportunity to provide feedback on the draft BEREC guidelines on very high capacity networks (VHCN) published for public consultation on March 10. GIGAEurope also welcomes BEREC's decision to extend the consultation period by a few days.

GIGAEurope's members provide reliable and secure Gigabit-speed connections to customers across Europe, offering world-class products and services, including converged fixed and mobile communications. Our members' networks are future-ready to meet ever increasing consumer demand for more broadband performance.

The deployment and take-up of VHCN is one of the objectives of the European Electronic Communications Code (EECC). The roll-out of VHCNs is key as only investment in VHCNs will underpin applications, business models and innovation that, in turn, will drive growth across the European economy and directly benefit European consumers. Investment and deployment of VHCN is also key to reach the European Gigabit society targets for 2025.

We concentrate on three areas for review:

- BEREC's adoption of performance thresholds for fixed networks based on 'best' available technologies over FTTB networks (**Section III.1**)

- Certain shortcomings identified with BEREC's methodology and analysis for setting the performance thresholds for fixed networks (**Section III. 2**)

- Measurement and verification approach for NRAs **(Section III.3**)

I. The EECC definition of VHCN

Article 2 (2) of the EECC defines VHCN networks as either an electronic communications network which consists wholly of optical fibre elements at least up to the distribution point at the serving location or an electronic communications network that demonstrates similar network performance, under usual peak-time conditions, in particular in terms of down- and uplink bandwidth, resilience, error-related parameters, and latency and its variation. Recital

13 specifies that, in case of a fixed-line connection, the “benchmark” network is an optical fibre installation up to a multi-dwelling building.

Article 82 of the EECC requires BEREC, by December 21, 2020, to determine the criteria that a network needs to fulfil in order to be considered a VHCN. It also requires BEREC to update the guidelines by December 31, 2025 and regularly thereafter.

It is essential that the guidelines remain strictly within the scope of the EECC, i.e. neither go beyond nor fall behind it. The guidelines ought to enable the delivery of the European Gigabit society while providing sufficient scope for relevant revision of parameters as technology evolves and networks are upgraded in line with demand.

II. The approach taken by BEREC

BEREC states in §12 of the draft guidelines that fixed VHCN networks, according to Article 2(2) of the EECC are:

a) any network with fibre roll-out at least up to the multi-dwelling building; i.e. FTTB/FTTH (so-called, criterion 1); and

b) any network which is capable of delivering under usual peak-time conditions a network performance equivalent to what is achievable by a network with fibre roll-out up to the multi-dwelling building (so called, criterion 3).

In order to determine the performance criteria that are necessary to fulfil criterion 3, BEREC proposes to define a number of end-user QoS achievable under usual peak-time conditions by the “benchmark” network, i.e. a network with a fibre roll out up to the multi-dwelling building (so -called, performance thresholds 1)[1].

BEREC proposes performance thresholds not only on FTTB networks with the ‘best’ available in-building network infrastructure technology (namely G.fast up to 212MHz on the in-building copper twisted pair and DOCSIS 3.1 on the in-building coax network) but also on the best performance achievable over those networks.

[1] These are: Downlink data rate (≥ 1000 Mbps), Uplink data rate(≥ 200 Mbps), IP packet error ratio (Y.1540) (≤ 0.05%), IP packet loss ratio (Y.1540) (≤ 0.0025%), round-trip IP packet delay (RFC 2681) (≤ 10 ms), IP packet delay variation (RFC 3393) (≤ 2 ms) and IP service availability (Y.1540)(≥ 99.9% per year).

III. Comments on BEREC approach

1. 'Best Technology' approach

As we see it, BEREC's approach is not fully consistent. BEREC states that the VHCN definition does not represent a unified concept and that it is sufficient to meet one criterion (criterion 1 or criterion 3 or both) to qualify as VHCN. More specifically, according to BEREC, "*a network which qualifies as a VHCN according to criterion 1 does not necessarily fulfil criterion 3*". This means that a "stand-alone" FTTB/FTTH network would not need to meet any QoS thresholds of criterion 3, whereas any other type of network would need to be assessed on the basis of those thresholds. BEREC has adopted these parameters based on the best achievable performance by the 'best technology' (G.fast and DOCSIS 3.1), to the exclusion of other in-building technologies utilised by FTTB operators. Whilst we agree that — as per criterion 1 — FTTB and FTTH networks are clearly intended under the EECC to be VHCN, the result of BEREC setting the parameters in this manner is that equivalent VHCN networks will be tested against stricter requirements than any FTTB/FTTH network. If this problem has its roots in the EECC itself which distinguishes between "benchmark" networks and equivalent performance, BEREC broadens the scope of the problem by not adopting a technologically neutral approach.

In reality, BEREC only partially — in respect of the access network — endorses such an approach when it says (§ 70) that criterion 3 "applies technologically neutral to all networks which provide a fixed-line connection (…) for example, to networks with an access network based on a. (Usual) twisted pair with DSL technology (e.g. G.fast), Coax cable with DOCSIS technology (e.g. DOCSIS 3.1) and twisted pair cable of category 5 or higher with Ethernet technology (e.g. Gigabit Ethernet)".

Technological neutrality, being a key principle under the EECC, requires that rules are applied in an equivalent manner across different network technologies. By adopting the 'best technology' approach and not requiring FTTB/FTTH networks to meet these same thresholds, BEREC sets differing standards which cannot be justified by the wording or spirit of the EECC, or the principle of technological neutrality.

GIGAEurope would agree that based on current and mid-term future considerations, other than gradual FTTH deployment, the two most relevant in-building infrastructures are still copper twisted pair and coax. However, whilst deployment of DOCSIS 3.1 over coax is being quickly and progressively rolled out to end-users, in-building deployment of G.fast is at an early stage, with chiefly standard VDSL2 deployment on twisted pair networks being more common.

Our members are particularly concerned that BEREC has adopted the performance thresholds 1 based on G.fast networks operating up to 212 MHz. FTTB networks using G.fast — even though still rarely found in practice — are usually operated at a frequency range up to 106/146 MHz only, due to stability and compatibility requirements. Indeed G.fast networks operating up to 212 MHz according to the lab standard, as considered the best available

technology by BEREC, are virtually not in use in the Member States for the time being and it is not expected that a future adoption of the full theoretical specification (including use up to 212 MHz) will take place to a noteworthy extent. Furthermore, validation of the field fitness for G.fast application in this extended frequency is still undergoing NRA evaluation.

In most countries it is not fully clear to what extent shifting from in-building VDSL2 to G.fast will take place due to a possible one step upgrade to FTTH from current FTTB networks. Moreover, there are a number of unresolved questions in regard to the co-use of G.fast and vectoring/supervectoring protocols on the same in-building network and regards electromagnetic interference of G.fast protocols with current and future wireless use of the same spectrum. We therefore question the relevance of this technology for use as the "benchmark" network.

2. BEREC methodological approach

Beside the above-mentioned concerns regarding BEREC's 'best technology' approach, there are a number of methodological problems and shortcomings within BEREC's analysis:

- **Adoption of median values is arbitrary, and not applied consistently to upload speeds:** BEREC's adoption of median values for the purpose of calculating performance thresholds 1 is overly simplistic. Particularly given the few data points actually taken into account, we consider that a more detailed analysis of the adequacy of the parameters as a whole could have been undertaken. BEREC has also applied this overly simplistic analysis inconsistently. In particular, it is not clear why BEREC has fully ignored the feedback from (cable) operators in regard achievable upload speeds under realistic conditions. Rather, BEREC has adopted 200Mbps based on what it considers the typically achievable speeds of G.fast 212 MHz services, which — as noted above — have not been deployed to any significant extent. Such performance could only be achieved by 7 of the 27 FTTB operators whose questionnaire responses were taken into account, and that is also without taking into account the other quality of service parameters (again, demonstrating the different standards being applied to FTTB operators captured under criterion 1 and other networks captured under criterion 3).

- **Consideration of specific national limitations:** BEREC did not consider specific national limitations on the network applicability of network technologies. For example, network operators may not have control of some network components, such as modems, that impact the performance of the whole network. Therefore, a network operator may have to force end users with privately owned DOCSIS 3.0 modems off its network in order to achieve higher than 100 Mbps upstream speed.

- **So-called "waterbed effect" between theoretical maximum technical parameters have not been accounted for:** Some technical parameters derived by BEREC do not take into account that certain individual parameters cannot be maximized in real networks at the same time due to technical trade-offs. For instance, achieving maximal bandwidth is not in line with realizing a minimum value for error-related parameters, latency and its variation due to necessary protocol requests which consume bandwidth. This leads to values which can only be determined in a laboratory situation for a single parameter without having an eye on other dependent parameters.

- **Consideration of testing standards:** Y.1540 as testing standard was established for point-to-point networks and server-to-server connections and requires a suitably equipped test probe or test capability at both the CPE and network measurement points. Realistic deployments involve test heads within an operator's domain, as near to the peering point as possible, to give a realistic measure of performance for the elements under their control and remove the impact of peering and external networks. That being said, there is much work underway in the standards bodies, including ITU-T. A new Annex B was included in Y.1540 in February 2020 that sets the range for round trip time variation to 5-250 ms. This takes into account new lab research by Spirent and others and sets the range above the minimum Round Trip Time (RTT). There are also other standard bodies, such as the Broadband Forum, working on testing approaches that better measure user experience, such as Quality Attenuation and Application Layer Testing. Hence, BEREC should permit the testing methodology to be agreed with the NRA in each country and reviewed with operators over time and should adjust its current value of 2ms — with reference to RFC 3393, and in light of the new research — to be equal to the minimum Round Trip Time of 10ms.

- **IP Service availability does not exclude external effects:** The median value for IP service availability found by BEREC is 99.9 % per year. It should be noted that this threshold can only be achieved in real networks if external factors like power outages are fully excluded. BEREC should clarify that this benchmark can exclude third-party external factors and usually cannot be measured under practical conditions.

- **IP speed tests for 1G download:** As BEREC note themselves several times, including in footnote 47, 1G IP rate requires more than a 1G Ethernet interface – and testing complexity. It would be much more practical for verification to specify 1G service as the Ethernet interface rate on Fixed, and 960M IP maximum.

It is clear that a more realistic and fact-based evaluation of the key performance parameters for a relevant benchmark has to be done. Otherwise any measurement of potential other VHCN in regard to "similar" network performance would be severely distorted.

3. Measurement and verification

As mentioned above, our members' networks can readily support Gigabit customer offerings which have been and will continue to be deployed rapidly. Our members are focused on innovating each segment of their networks to ensure sufficient capacity is available — end-to-end — to offer the Gigabit services of today and the symmetric multi-Gigabit services of tomorrow.

This being said, each of our members operates its network in different ways and the technology underlying each network may perform somewhat differently on the ground (even across the footprint of a single operator). This is most relevant for measurements to be carried out by NRAs. It is unclear how NRAs will measure whether a network meets the relevant performance thresholds. In concrete terms, it is unclear whether a network will be measured "as is" or also if short term upgrade possibilities will be also taken into account. This could be relevant in terms of upload speeds where simple software and hardware updates would suffice (without any additional fiber roll-out). The more BEREC seeks to define networks of the future, by benchmarking their theoretical capabilities, the more difficult it will be for NRAs to verify the relevant QoS. For example, it is unclear how an "internet speed test" "under peak time conditions" "at the end of the subscriber access line (not including the CPE)" of a service that is not actually offered will be performed.

BEREC's Guidelines on the consistent application of geographical surveys and forecasts are important in this context. Under these guidelines, BEREC will use three data categories for QoS[2]: QoS-1 to characterise the reach and performance of broadband networks, including VHCN (Phase 1, completed) and QoS and Qo3 indicators as a means of verifying QoS-1 data (Phase 2, to be completed in December 2020). It is unclear how QoS or experience can be measured if there are no commercial services being offered by the operator that are capable of meeting these criteria.

IV. Suggested approach

As mentioned above, BEREC should remain focused on the delivery of the Gigabit Society objectives and implementing the Guidelines in line with the spirit and wording of the EECC. This means that performance thresholds should not be based on technologies that have limited relevance (because they are at an early stage of deployment), on services that are not commercially available or on criteria that result from lab results or field trials. There is no point

[2] Based on the European Broadband Mapping project which developed three data categories for 'Quality of Service' ('QoS'): Data category QoS-1: Calculated availability of Service - Theoretical network performance of existing infrastructure; Data category QoS-2: Measured provision of Service - Measurements via panel probes or drive tests, excluding end user's environment; Data category QoS-3: Measured experience of Service - Measurements using internet access service including end user's environment, for example via online speed tests.

in defining VHCN based on performance by FTTB networks on performance standards that can be only achieved by a limited sub-set of FTTB networks.

In addition, in order to limit the unequal treatment of networks (i.e. specifically those subject to BEREC's performance checks) and the distortion of investment incentives, GIGAEurope considers that BEREC should take into account all types of in-building technologies that can be found in multi-dwelling units and not only G.fast and DOCSIS 3.1.

We therefore encourage BEREC to:

1) Take into account achievable end-user QoS in a technological neutral manner, by comparing all in-building technologies to the "benchmark" network. Since the EECC does not specify the type of infrastructure or technology required between the distribution point and the end-user, we consider BEREC's proposed approach too narrow. Instead, we consider that BEREC should base the benchmark fixed network performance thresholds on the performance of either the lowest performing in-building technologies that exist in the market today, or the most common (such as VDSL over copper and both DOCSIS 3.0/3.1 over coax). The former would be more in line with the wording of the EECC, and the principle of technological neutrality. The latter would at least ensure that non-FTTB/H operators are held to the same performance standards as what is achievable by the majority of FTTB operators (and not a select elite few). This is even more crucial as it is unclear to what extent these new technologies will be deployed in future, and how they will perform in real-life networks.

2) Review its methodological approach and analysis to take into account the issues identified above, including national limitations, the impact of waterbed and external effects, the appropriateness of the specified testing standards, and consistency (of both methodology and outcomes).

3) Provide details on the approach it intends to take for verification by NRAs of the QoS-1 information, including via QoS-2 and QoS-3 indicators, covered by the BEREC Guidelines on the consistent application of geographical surveys and forecasts (Phase 2 of these guidelines).

Finally, we also encourage BEREC to hold another stakeholder meeting soon after closure of the consultation but at least before finalising the VHCN guidelines.

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About GIGAEurope

GIGAEurope is an industry organisation that brings together private operators who build, operate and invest in the gigabit communications networks that enable Europe's digital connectivity. Our members offer world-class products and services, including converged fixed and mobile communications. GIGAEurope's members serve around 40 million fixed broadband customers and 130 million mobile customers spanning across Europe.

This paper represents the views of the full members of GIGAEurope, and not necessarily those of our associate members, partners or affiliates.