

## **Draft**

# **Report on the BEREC public consultations on net neutrality**

- Draft report on differentiation practices and related competition issues in the context of net neutrality [BoR (12) 31]
- Draft guidelines for quality of service in the scope of net neutrality [BoR (12) 32]
- Draft report on assessment of IP interconnection in the context of net neutrality [BoR (12) 33]

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# 1. INTRODUCTION

On 29 May 2012, BEREC launched a public consultation on three documents related to net neutrality:

- Draft report on differentiation practices and related competition issues in the context of net neutrality (BoR (12) 31)

This report on competition issues examines and assesses the potential impact on users of departures from net neutrality at the initiative of ISPs. The report examines which differentiation practices applied to the Internet access service may harm the interests of users and have a negative impact on competition and innovation, both in electronic communications markets and in content application and services markets. The report aims to provide a conceptual framework for assessing potential concerns relating to user harm, and identifies the main elements of any such assessment.

In the consultation BEREC particularly sought input on the description of the value chain and the tendencies described in the document, the assessment of the three examples provided (VoIP, P2P and CAP differentiation), and the final conclusions reached in the report.

- Draft guidelines for quality of service in the scope of net neutrality (BoR (12) 32)

These guidelines follow on from the BEREC framework for quality of service in the scope of net neutrality (BoR (11) 53) published in December 2011. The draft Quality of Service (QoS) guidelines discuss the purpose as well as the scope and extent of Article 22(3) of the Universal Service Directive, which introduces the competence of NRAs to set minimum quality of service requirements in order to prevent degradation of service, and elaborate on concepts such as Internet access service, specialised services, QoS, network performance, congestion, traffic management, restrictions, degradation, throttling and blocking.

In the consultation, BEREC asked for stakeholders' comments in particular on the criteria proposed for the assessment of, on the one hand, degradation of the Internet access service as a whole and, on the other hand, issues regarding individual applications used over the Internet access service, and also sought input on the conditions and procedure for regulatory intervention, as well as on the relevance and exhaustiveness of the scenarios described.

- Draft report on assessment of IP interconnection in the context of net neutrality (BoR (12) 33)

The focus of this report is on the wholesale level of interconnection between ISPs and other intermediaries in the Internet value chain. It analyses how deviations from net neutrality may be reflected at the interconnection level governing transmission of packets across the Internet as a collection of different networks.

In the consultation, BEREC asked questions at the end of each section of the draft report, in particular to seek input on the role and classification of players along the value chain, new types of interconnection developing and the impact on the competitiveness of the market.

The consultation was published on the BEREC website, inviting stakeholders to send their replies up to 31 July 2012. A total of 72 replies were received, from a range of organisations, including consumer associations, operators and content providers, as well as individuals. This report is not intended to be a comprehensive compilation of the replies gathered. Its purpose is rather to provide a general overview of the main comments and views received around the key topics and questions concerning the draft documents. BEREC welcomes this feedback and thanks the respondents for their efforts and submissions. The full text of these submissions is available on the BEREC website. The draft documents have been modified, taking the relevant stakeholders' comments into account, in an effort to add to the understandability and clarity of the documents and also to ensure better alignment between the three documents and other BEREC documents relating to net neutrality.

## 2. SUMMARY OF STAKEHOLDER RESPONSES

### 2.1. Draft report on differentiation practices and related competition issues in the context of net neutrality (BoR (12) 31)

#### 2.1.1. Introduction

Most stakeholders agreed with BEREC that market transparency, consumers' awareness, competition at retail level, low cost of switching and the elimination of barriers to switching are important factors in preventing differentiation practices that harm users.

Some of them favoured, in most circumstances, the use of ex-post instruments available under competition law, and case-by-case analysis of certain practices which may threaten net neutrality, over ex-ante remedies; the latter should be a last resort and be subject to a high burden of proof. The same respondents argued, moreover, that the current EU electronic communications framework and regulatory practice were sufficient to ensure smooth operation of the Internet and that there was no need for additional regulatory or legal instruments, as they might even work against innovation and investment. Some stakeholders were moreover concerned that the quantity of recent BEREC net neutrality-related documents could trigger disproportionate regulatory intervention. Others suggested referring in the BEREC Report to industry self-regulation, based on examples from some countries.

Another group of stakeholders pointed out, however, that competition at the retail level, transparency and easier switching, although worth promoting, are insufficient deterrents against discrimination and could not be relied upon to protect the openness of the Internet; a clearly expressed norm and political support for non-discrimination and net neutrality was needed. These stakeholders were also mostly of the view that competition law alone was not sufficient to safeguard an open Internet and that ex-post measures could not always undo the harm already done, in particular given the length and cost of ex-post investigations. Moreover, the results of BEREC and EC traffic management investigations were invoked (BoR (12) 30) to underpin the need for preventive and proactive monitoring by national regulatory authorities (NRAs) in the area of net neutrality given the existence of restrictions to the open Internet. The need for development by BEREC and the EC of a policy framework and guidance promoting broadband and safeguarding the openness of the Internet was expressed. A legislative approach to net neutrality with the aim of consistent application across EU Member States and legal certainty for consumers was also mentioned. Regarding the current framework, the opinion was expressed that it should be interpreted and applied in light of the underlying goals of net neutrality regulation. Net neutrality rules should, moreover, aim at preserving the Internet's ability to serve as an open, general-purpose infrastructure providing value to society over time in various economic and non-economic ways. The need to keep the cost of regulation low was also stressed. Along the same lines, it was emphasised that self-regulation efforts did not seem sufficient to guarantee an open Internet. Some stakeholders pointed out, moreover, that the difficulty and cost of switching were greater for a business user than for a single-device user.

Several stakeholders pointed out a lack of consistency and a need for alignment of conclusions among the three BEREC net neutrality-related reports submitted for public

consultation as well as between the latter and the previous BEREC net neutrality-related documents. Other general comments regarding the three draft reports were that they were unbalanced and not forward-looking. However, BEREC's approach using four angles – QoS, Transparency, Competition and IP interconnection – was welcomed. A view was additionally expressed that for regulatory certainty reasons BEREC should limit net neutrality-related documents and should summarise the findings of all existing documents in one.

*As regards the role and efficiency of transparency and switching, BEREC considers that improving transparency and smoothing switching between operators are structural measures which are intended to foster competition. In a competitive retail market, transparency and switching empower users to select products according to their "first rank" characteristics. It may be less effective as regards options on which users do not base their choice.*

*BEREC acknowledges that this approach might not be sufficient in some cases and that more intervention might be needed after a thorough analysis. Previous work (including the investigation of actual differentiation practices, published in May 2012) showed a significant level of heterogeneity in Europe regarding the situation of national markets. In 2013, BEREC will conduct an empirical study to assess the drivers and efficiency of switching.*

*As regards the coherence of reports, BEREC has harmonised terminology through its reports on net neutrality. In particular, BEREC's report on IP interconnection and the present document are based on the same description of the Internet ecosystem, which identifies several functions. Each report then elaborates on this initial description, by providing further details on the parts of interest in this ecosystem.*

*Furthermore, an overall policy paper approach has been elaborated, which summarises BEREC's analysis, its findings and its line of action as regards net neutrality.*

### 2.1.2. Value chain

Stakeholders in general agreed with BEREC's comprehensive description of the Internet value chain, including its technical aspects and recent trends, as well as with its thorough assessment of differentiation practices, including their potential impact on users. Some respondents raised specific points and these are presented below.

Several stakeholders asserted that the whole value chain needs to be taken into account in order to preserve an open Internet and when looking at evolutions in the market. This is because consumers' choices can also be affected by technical and commercial choices of CAPs, device manufacturers or technical intermediaries, e.g. transit or CDN providers.

Although all stakeholders expressed their strong support, in principle, for net neutrality, they differed in their views of which actors in the value chain were most responsible for its possible breaches and for its future prospects of development.

One group of stakeholders tended to place more responsibility on ISPs with regard to preservation of net neutrality. In this respect, disagreement was expressed with BEREC stating that developers of applications on the Internet demanded a level of quality going beyond traditional "best effort" of Internet access and that operators would need to

implement traffic management tools to allow these new applications to appear and grow. The view was also expressed that, in principle, ISPs should not be allowed to block any content as, alongside investment in additional bandwidth capacity, there were techniques for reducing the congestion burden. Other stakeholders were concerned about the intention of many ISPs to charge content providers for their content delivery across the ISPs' networks, as it would put many individuals and small/medium-size enterprises out of business. It was also observed that ISPs influence hardware and/or software producers and that such behaviour has at least an indirect impact on net neutrality. An alternative value chain was also proposed. Some stakeholders mentioned that the necessity for ISPs to use differentiation practices has not been sufficiently justified by congestion or lack of return on investment. Moreover, the cost of network upgrading is expected to fall; once traffic management practices have been introduced, they will be difficult to retract.

In contrast, another group of stakeholders indicated other factors threatening net neutrality, related not to ISPs' activities but rather to the activities of other actors in the value chain. Some of the respondents pointed out the importance of describing more of the differences between content and application providers (CAPs), bearing in mind the strong interrelation between their different types of activities (content, platform and network). In this respect, BEREC should further address the fact that, if a single market player occupies a dominant position in one of the above listed fields, such a situation could disturb the balance of the overall network and affect its neutrality. Some stakeholders recommended that BEREC analyse effects on users and ISPs caused by CAPs with significant market power (SMP). Others advised that it further analyse the role of content delivery networks (CDNs) in the Internet ecosystem, e.g. the effects of large CDNs on the innovation potential of small and medium-sized enterprises and/or the existence of barriers to entry. It was pointed out along the same lines that ISPs are treated more severely than CDNs when it comes to the introduction of quality-enhancing mechanisms. It was also stressed that highly concentrated market power will most likely not reside with network operators in the future. Furthermore, it was pointed out that the value chain as presented by BEREC was a short-sighted one as ISPs were no longer the most valuable part of it, with the Internet becoming a two-sided market (service providers and users), cutting off network operators from revenues. It was stressed that, although ISPs and CAPs depended on each other, ISPs should not be burdened with further specific regulation on net neutrality as they are already in the most regulated part of the value chain. Regulation should allow ISPs to sustain the necessary investment in networks.

On the role of traffic management, it was also concluded that BEREC did not make adequate distinction between fixed and mobile networks, and thus was incorrect in saying that traffic management was necessary only because of a failure to deploy adequate capacity. Moreover, some stakeholders disagreed with BEREC that traffic management was only recently introduced, on account of traffic congestion; rather, it has been applied since the beginning of the Internet to ensure the efficient use of capacity. The scenario presented by BEREC, that in the future it will be more common for CAPs to be blocked unless they pay ISPs, was also questioned. The view was also expressed that CAPs should be assimilated not to users but rather to the traditional scheme of a wholesale commercial relationship with network operators. CAPs and users were two different categories and, contrary to what BEREC suggests, should not be considered as clients of ISPs.

Other stakeholders welcomed measures ensuring fair competition between players in the value chain, and common criteria to enable NRAs to better assess traffic management practices. Some comments received in this regard stressed that fair distribution of the Internet value chain and a level playing field for all actors in the value chain were key for industry actors and for efficient Internet operation, which required enabling the implementation of business models with an adequate return on investments. Some stakeholders stated also that mobile network operators (MNOs) had a different position in the value chain from mobile virtual network operators (MVNOs) as they were dependent on the latter in terms of, among other things, mobile access and transmission networks; MVNOs could not develop any traffic management but were subject to MNOs' restrictions on QoS and traffic prioritisation. It was also pointed out that discrimination against VoIP services indicated that competition among ISPs, the absence of an ISP with SMP or the existence of transparent users' agreements were not necessarily sufficient to stop foreclosing and innovation-hindering practices.

*In the questions about "net neutrality" and differentiation practices, content and networks are closely linked. This often leads one to consider the whole value chain when addressing the debate.*

*BEREC is of the opinion that, in the Internet ecosystem, operators which convey information over networks are playing a central role because they are the unavoidable link needed by end users who want to send or receive information using the Internet.*

*NRAs' remits and powers are focused on electronic communication networks and services, as framed by the European legislation. Consequently, this report deals with the "network neutrality" debate and mainly addresses the issues faced on electronic communication markets and looks closely at Internet service providers in terms of their role in transmitting information between end users. This focus does not mean that other markets, including content and application markets, should be outside any form of scrutiny.*

*When analysing the competitive situation of electronic communication markets, NRAs do take into account the contents which are conveyed over them, following the policy objectives set by the European Framework, which notably entitle them to ensure "that there is no distortion or restriction of competition in the electronic communications sector, including the transmission of content" (Framework Directive, Article 8(2)(b)) and to promote "the ability of end-users to access and distribute information or run applications and services of their choice" (Article 8(4)(g)).*

*This focus from BEREC and NRAs on electronic communication markets does not mean that other markets, including content and application markets, should be outside any form of scrutiny. Questions and debates arise as regards, for example, fair competition on the online search market (sometimes referred to as "search neutrality"), or the control that operating system (OS) manufacturers may exert on the content and services displayed through their platforms (terms and conditions of online applications stores). This could be referred to as the "internet economy neutrality" debate.*

*Additionally, in this regard, it should be noted that the competitive situation of content and application markets is receiving close attention from competition authorities. Notably, the*

*web search market and the specific situation of Google have been extensively monitored by the European Commission.*

### 2.1.3. Possible differentiation practices

Several stakeholders stressed that it was normal for competitive markets to offer price and service differentiation, as it reduces the risk of congestion and promotes a fair distribution of capacity to the benefit of all users. At the same time, CAPs and ISPs should share responsibility for users' awareness that not all applications function with a sufficient level of quality on all types of subscriptions. Concerns about overall quality of best-effort Internet with the introduction of managed services were deemed rather theoretical. For this reason some stakeholders supported BEREC's statement that it is difficult to conclude a priori whether certain forms of differentiated treatment are reasonable or not. It was stressed along the same lines that EU legislation did not mandate NRAs to predetermine commercial offers in competitive retail markets for fixed or mobile broadband access services or to autonomously determine what traffic management was reasonable or unreasonable.

With regard to congestion, some stakeholders stressed that there must be objective evidence that expansion of capacity cannot remedy congestion, in which case ISPs could resort to traffic management and differentiation practices. It was also proposed to introduce pricing as a remedy for congestion, as price differentiation might cure at least some congestion problems. It was stated in addition that best effort must be kept open in non-congested situations.

As far as the network effect is concerned, some stakeholders stressed that a more thorough analysis was needed. Others commented that BEREC had overstated the network effects of blocking and charging and those current practices do not compromise network effects because in all offers there were non-blocked or charged offers for, for example, VoIP. Moreover, it was argued further that the subscribers who cannot be reached by others because they have chosen a cheap offer without VoIP possibility would not want VoIP anyway. In that case there were no network externalities lost. Another stakeholder stated that BEREC's reasoning was not clear enough.

With regard to application-agnostic traffic management versus application-specific traffic management as a way to reduce congestion, the observations received were divided around the two main general positions. Some respondents argued strongly that application-agnostic traffic management, which is effective and does not have the disadvantage of targeting specific usage, is not always an efficient way to reduce congestion, in particular when congestion is caused by specific applications. Other stakeholders insisted that BEREC should promote application-agnostic traffic management. Finally, some mentioned that good network management consists of responsible use of both application-specific and application-agnostic traffic management.

*Although traffic management is not a bad thing per se, and may sometimes be necessary to ensure smooth conveyance of data over networks, when two practices achieve equivalent objectives, BEREC would prefer the one which is the more application agnostic. This preference is motivated by the weighing up of potential long-term effects of application-specific practices on the Internet ecosystem, and also acknowledges that a strict judgment should not be made before a case-by-case analysis.*



#### 2.1.4. Conceptual toolbox for the assessment of practices

Several stakeholders expressed the view that operators should be allowed to employ reasonable network management techniques (e.g. prioritisation or differentiation of classes of traffic) where best effort is not sufficient. One respondent noted that viable best-effort access will make prioritisation redundant. Some respondents concluded that the debate should be not whether traffic management was needed but where to draw a line between legitimate and harmful differentiation practices: degradation and blocking versus prioritisation. Other stakeholders claimed that managed services should be seen as an entirely different product from Internet access sold by ISPs. In this context, the view was also expressed that discrimination hampers innovation and reduces cultural diversity, so that BEREC's statement about possible positive effects of discriminatory practices was not correct.

Some stakeholders disagreed with BEREC that differentiation practices implemented by SMP operators, especially vertically integrated ones, should cause more net neutrality concern. It was further pointed out that BEREC's analysis is based on theoretical situations of two practices and it may give the negative impression that ISPs may have SMP and consequently behave wrongly. Such possible discriminatory and anticompetitive behaviour by integrated ISPs should be addressed by market analysis if needed and is not strictly linked to net neutrality. Others stressed that regulatory tools imposed on SMP operators will not be efficient since net neutrality violations result from a termination monopoly on the market for access to end users rather than of SMP on the end-user market itself.

Some stakeholders expressed the opposite view, agreeing with BEREC that vertical integration (i.e. elimination of separation of layers) gives an incentive to ISPs to implement differentiation practices, with a risk of blocking competitors, to the detriment of consumers' ability to enjoy neutral access to the Internet. Along the same lines one stakeholder was of the opinion that BEREC should focus not on the shift of the Internet away from the best-effort concept but on SMP-related problems among participants in the Internet.

Several stakeholders were sceptical about the two-sided market theory presented by BEREC or saw the need for its further consideration. Some pointed to a contradiction in BEREC's reasoning; on one hand, BEREC is neutral with regard to a model based on some type of traffic payments by CAPs and advises studying the idea, while, on the other hand, BEREC is sceptical, highlighting positive effects of the current model on development and innovation. Others agreed with BEREC that the situation in which Internet access providers (IAPs) charge CAPs to access their users is worth exploring, provided that charges for best-effort access are covered, which is problematic. One stakeholder expressed the view that two-sided market theory was an oversimplification as it ignores more balanced enterprise-to-enterprise use of the Internet by business users, including for communication/information sharing between units within their own organisations. Other stakeholders argued that two-sided market analysis is not appropriate, as the Internet does not involve one single intermediate player offering a full service. Other critical views stressed that the existence of attractive content, applications and services on the Internet is the only reason that customers of ISPs/IAPs are willing to purchase Internet access, or that two-sided market theory constitutes a move away from best-effort Internet.

Two stakeholders suggested, moreover, that BEREC investigate deeper relations between CAPs and IAPs, which were deemed very important from the competition law perspective. It was stated by one of the stakeholders that a regulatory imbalance exists between CAPs providing non-regulated offers (e.g. unmanaged VoIP) and authorised IAPs providing regulated offers (e.g. plain old telephony service – POTS).

*As regards the control of ISPs over the traffic, at any given time, the user's ISP can be seen as a bottleneck which controls the transmission of information between him or her and the rest of the Internet. This is the ground on which, to a large extent, the debate on net neutrality has grown up. However, BEREC is of the opinion that the Internet access retail market is acting as a disciplining force on this bottleneck. NRAs, through wholesale regulation, transparency and switching, endeavour to strengthen this force, which exerts some level of control over the bottleneck. BEREC acknowledges that this control may not always be sufficient. However, it appears to work most often. It is, in any case, useful to strengthen this control as much as possible.*

#### 2.1.5. Analysis of practices

Several stakeholders invoked BEREC's and the EC's investigation of traffic management in Europe. Some of them argued that the results proved that limitations on accessibility of mobile VoIP services and applications were remedied in most countries by competition. As far as the different practices analysed by BEREC are concerned, some stakeholders argued along the same lines that BEREC's draft report presents the theoretical cases but at the same time recognises that the majority of Internet users are wholly unaffected by these practices. Others argued, moreover, that the effect of restrictions is analysed on unregulated retail markets. Thus, SMP assessments are theoretical and unlikely to occur. A view was additionally expressed that no specific regulation should be introduced regarding differentiation practice on VoIP as it would limit MNOs' commercial freedom. Moreover, technical management of available bandwidth is acceptable.

Conversely, other respondents were of the opinion that VoIP blocking was a reality in Europe. Moreover, as VoIP services and applications do not consume substantial network resources there is no case for reasonable traffic management to block or hinder VoIP traffic or ask for surcharge, and they argued that such practices should be prohibited by BEREC/NRAs as distortion of competition.

With regard to the differentiation practice of P2P blocking on fixed broadband, some stakeholders were of the opinion that ISPs should not to be burdened by further specific regulation on net neutrality as they are already in the most regulated part of the value chain. Some stakeholders expressed the view that P2P should be protected. Others considered that, since the market in this field functioned well, there was no need to regulate it. Another specific comment received concerning this topic claimed that P2P-agnostic throttling on fixed broadband is part of operators' network management practices to ensure satisfactory average quality for all customers and thus should not raise concerns provided that discrimination does not occur.

With regard to differentiation of services to CAPs, the view was expressed that access to the Internet by content providers must not depend only on their financial power. More

specifically, one stakeholder was of the opinion that BEREC's statement about negative differentiation being unlikely in a competitive market needs to be checked with tools providing reliable and real-time traffic data. Other stakeholders claimed that differentiation of services to CAPs was acceptable if operators did not discriminate among CAPs and applied equivalent conditions in equivalent circumstances. One stakeholder stressed that a defining characteristic of the Internet economy has been low barriers to entry, which might change if ISPs enter exclusive partnerships with certain CAPs.

The view was also expressed that most differentiation practices are commercial, not technical, and consequently do not relate to the net neutrality debate. Other stakeholders agreed with BEREC that positive and negative differentiation (prioritisation/degrading) should be treated differently. Lastly, one respondent noted that BEREC should focus not on analysis of different traffic management techniques, which are always needed for the normal functioning of the network, but on cases of possible abuses in terms of non-discrimination/competition.

With regard to a possible "dirt road Internet" resulting from conflict between best-effort Internet Access Services (IASs) and specialised services, some stakeholders found that this scenario was not relevant; IASs will be strengthened thanks to the continuous development of standards and the foreseeable development of consumer demand. Other stakeholders called for safeguards against ISPs' incentives to discriminate to ensure quality of Internet access, in order to avoid a "dirt road" effect, in parallel with possibilities for ISPs to offer managed services. Others warned that the dirt road effect is already occurring.

*The observations from stakeholders on the framework do not give rise to any specific comment on the part of BEREC.*

#### 2.1.6. Conclusions

The support of stakeholders for differentiation and traffic management practices varied from cautious to strong; some stressed that such practices should be scrutinised further as they may create incentives to reduce investments in network capacities and infringe the connectivity of users and content and media providers. A view was also expressed that differentiation practices should be based on objective criteria and be non-discriminatory, otherwise distortion of competition may arise. Others, along the same cautious lines, indicated that traffic management practices should be deployed only in order to more efficiently manage traffic on the network in demonstrated cases of acute congestion.

The observations received were divided with regard to application-agnostic traffic management versus application-specific traffic management as a way to reduce congestion.

One stakeholder stressed that BEREC's uncertainty about regulatory protection and the real threat of discrimination not only may affect innovation in the future but is in fact already affecting it today. Moreover, vertical integration between provision of infrastructure and content, although not a problem per se, could be seen as a risk, as well as Deep Packet Inspection techniques, which go against confidentiality of communications. Conversely, other respondents emphasised that an unmanaged network is not neutral as, without any traffic

differentiation by ISPs, it is prioritised because of underlying applications. It was, moreover, argued that network owners should be free to offer added value services and to dedicate capacity to specific managed services on their networks with enhanced or guaranteed QoS. The role of effective traffic management in remedying congestion and optimising performance of various applications using networks was stressed. It was observed, in addition, that BEREC does not recognise that diversity of offers is a key characteristic of a competitive market and that it should be supported in principle; commercial differentiation is the best way of achieving efficient allocation of scarce resources.

With regard to ISP–CAPs relations, some stakeholders saw the need to analyse them in more detail, given an increasing imbalance in network dynamics in favour of CAPs, and to support the possibility of ISPs sustaining properly the necessary investments to enhance their networks. It was stressed also that, unlike ISPs, CAPs have an incentive to optimise the performance of only their own application or content in the network; this was reflected in the BEREC report.

Overall, some stakeholders prized BEREC's draft report for appropriately pondering risks and opportunities without drawing any final conclusions and for establishing a basis for discussion, as well as for its clear presentation of the concerns about net neutrality violations and a comprehensive overview of the incentives for ISPs to violate net neutrality. On the other hand, others pointed to the lack of recommendations stemming logically from BEREC's findings as well as a failure to identify which practices should be prohibited.

Stakeholders agreed specifically with BEREC in particular on the undesirability of discriminatory practices and the importance of competition, transparency and reduction of barriers to switching, which they deem to be key factors for innovation, economic efficiency and citizens' access to information. Several stakeholders expressed their support for transparency and quality of service. It was pointed out in particular that transparency of traffic management and quality of service required a joint approach involving NRAs, ISPs and consumer organisations allowing different Internet subscriptions to be compared. Some stakeholders pointed out, however, that switching is often not easy, either because of the significant costs involved or because of contractual restrictions.

*As regards regulatory action, as a general rule, BEREC is of the opinion that fostering competition in electronic communication markets is the first means of action for regulators. To this end, Article 7 is the appropriate tool, well beyond the issues related to net neutrality. It is specifically relevant for wholesale markets, as retail markets are generally not regulated today.*

*If some problems cannot be tackled by pro-competition powers, NRAs may have to intervene with other tools, such as the imposition of minimum requirements for quality of service. Issues related to net neutrality may appear independently from the operators' market power and would require a case-by-case analysis before any intervention. If deemed necessary, such requirements would particularly focus on the products offered on Internet access retail markets, rather than wholesale (e.g. interconnection) markets. The process of imposing these requirements is extensively examined in BEREC's Guidelines for quality of service in the scope of net neutrality.*

*BEREC does not seek to define specific trigger levels or thresholds for intervention. It gives an analytical framework to NRAs for them to conduct an assessment of each relevant situation, in their national context.*

## 2.2. Draft guidelines for quality of service in the scope of net neutrality (BoR (12) 32)

### 2.2.1. Chapter 2 - Background and scope

Some respondents remarked on an urgent need to adopt pre-emptive minimum quality of service (QoS) requirements in accordance with Article 22(3) of the Universal Service Directive (USD) to ensure/restore net neutrality. However, some respondents stated that the Article 22(3) USD minimum QoS requirements are very burdensome and thus should be used only as a measure of last resort in exceptional circumstances and that the focus of regulators should be to effectively implement other tools, particularly transparency.

*The BEREC NN QoS Guidelines have already balanced these opposing views. The focus of the guidelines is on how to interpret Article 22(3) USD, setting out criteria for evaluation of Internet access service offers in themselves and at the market level. The Regulatory Framework does not seem to allow for more prescriptive measures. In addition, the choice of different regulatory tools is covered in chapter 6 of the guidelines.*

Another opinion expressed was that the net neutrality provisions of the Regulatory Framework do not relate to operators providing services to large business customers, and it was suggested that only the term “consumers” be used when referring to any obligations, in order to prevent the scope of regulation being expanded to operators which provide services to business customers.

*Article 22(3) USD is designed around behaviour and covers a broad spectrum: “degradation of service and the hindering or slowing down of traffic over networks”. This provision does not explicitly define whom it seeks to protect. However, Article 8(4)(g) FD expresses the broad scope envisaged by the lawmaker in Article 22(3) USD, as it refers to end users, not just consumers.*

Various stakeholders stated that any regulatory monitoring should focus only on QoS of the Internet access service (IAS) delivered by, and under the control of, the individual operators and not on users’ general quality of experience (QoE), which may be affected by numerous factors outside the control of individual operators. Some mobile operators also pointed out that, given the high variability of the network conditions and diversity of equipment with regard to mobile services, it is not possible to guarantee a particular QoS/QoE on mobile networks; consequently, any definition of QoS requirements should take into account the nature of mobile networks. One stakeholder also called for more emphasis on the fact that the QoS offered by alternative operators will depend on the QoS they receive from wholesale operators.

*The BEREC NN QoS Guidelines set out a broad range of monitoring methods, but regulatory decisions based on monitoring results will need to acknowledge the quality assurance of those results in order to provide evidence to support the decision. This is already covered by the guidelines, and detailed background information is also available in*

*the 2011 BEREC NN QoS Framework. The BEREC response to the Commission's 2010 consultation on the open Internet and net neutrality called for the same approach to net neutrality in fixed and mobile networks, while acknowledging specific technological circumstances in mobile networks. BEREC will also conduct a study on quality measurement methods and tools for Internet access services in 2013. BEREC is aware of the different conditions to which mobile networks are subject, and this is already recognised in the guidelines. The impact of wholesale services on retail services may have to be taken into account when setting the level of the QoS requirements.*

A few respondents asked for a clearer definition of specialised services, a few claimed that the current distinction between IASs and specialised services is arbitrary, and some viewed the distinction as too simplistic.

*BEREC is aware of the difficulty of giving a precise definition of the distinction between the two service categories, and this is further emphasised in the final version of the guidelines. The description of specialised services has been updated with some new aspects, but the basic idea remains the same. For the time being, BEREC finds the concept of specialised services useful in order to acknowledge technology neutrality between legacy services such as circuit-switched telephony and cable TV, on the one hand, and their IP replacements as facilities-based VoIP and IPTV, on the other.*

### 2.2.2. Chapter 3 - Main regulatory issues related to QoS in the context of net neutrality

Many respondents (mainly operators) adopted the position that, in order to solve any potential net neutrality issues, national regulatory authorities (NRAs) should primarily focus on transparency, fostering efficient competition and ensuring ease of switching. Any additional formal regulatory QoS obligations should be imposed only in cases of degradation so serious that it would severely and permanently impact users' access to content, application and services of their choice and only when competition strengthened by transparency is not sufficient.

*As described above, other regulatory tools also have a role in the overall situation. However, these BEREC NN QoS Guidelines are specifically provided in order to interpret how to apply Article 22(3) USD in practical market situations.*

In contrast, some consumer organisations, content providers and individuals expressed the need for immediate and strict QoS requirements to be imposed on IAS providers. They claimed that the effects of transparency obligations and the role of switching are overestimated and cannot solve the QoS degradation and wider net neutrality problems which are already present in the market.

*The purpose of these BEREC NN QoS Guidelines is to provide a regulatory tool for NRAs to use for evaluation of the market situation in each country. If a severe situation arises, the relevant NRA should evaluate the situation as described in these guidelines. Regarding the role of switching, BEREC will in 2013 carry out a study of consumers' incentives and market forces driving net neutrality developments.*

Some stakeholders also expressed the opinion that any potential obligations should be imposed symmetrically on all players in the value chain on a certain market, whereas others find asymmetrical measures imposed only on dominant operators to be more appropriate.

*The balance between symmetrical and asymmetrical application of the minimum QoS requirements is already covered by the BEREC reports on net neutrality, in particular in the report on differentiation practices and competition issues related to net neutrality.*

With regard to monitoring of quality, some stakeholders pointed out that, to ensure validity and comparability of data, neutral and standardised measuring systems are needed. Some stated that NRAs should be the ones monitoring, using their own tools, or should at least provide hardware and software measuring equipment to end users.

*The BEREC NN QoS Guidelines already discuss these aspects related to monitoring of the quality of IAS. In addition, as described above, BEREC will conduct a study of Internet quality measurement methods and tools in 2013.*

Mobile operators again drew attention to the basic differences of providing services over fixed and mobile networks and warned that these differences must be taken into account when considering imposing any obligations to meet QoS requirements.

*The BEREC NN QoS Guidelines already discuss these aspects related to the specific conditions in mobile networks. These aspects may be further studied in the 2013 study of Internet quality measurement methods and tools.*

Many respondents claimed that any minimum QoS requirements imposed should relate only to IAS and that any such requirements relating to specific applications would be illegitimate, disproportionate and very hard to achieve in practice.

*Although the BEREC NN QoS Guidelines suggest the possibility of monitoring performance of individual applications in order to detect application-specific throttling, the guidelines do not suggest imposing explicit QoS requirements for specific applications in general on today's best effort Internet. However, if a case occurs in which specific applications are degraded by an ISP, the imposed QoS requirement may specify elimination of this degradation.*

A few cable operators remarked that the name for Scenario B (Cable TV Internet) is misleading as it might suggest that cable operators are constantly engaged in uncompetitive practices. They suggested that the name be changed.

*The intention of this name was not to point at cable TV providers in particular; rather, it was intended to recognise the practice of providing defined packages of TV channels as opposed to the Internet, which traditionally provides access to any "channel". BEREC has therefore changed the name of the scenario to "Packaged Internet".*

Some operators warned against guidelines restricting operators' flexibility to provide differentiated offers and pointed out that contractual limitations of IAS should not be a trigger for QoS requirements under Article 22(3) USD, provided that users are duly informed of such limitations in accordance with transparency obligations. Users should be able to choose restricted offers in accordance with their specific needs and price preferences. If unrestricted offers are also available on the market, operators should not be prevented from providing



limited offers and any regulatory intervention should be limited to cases in which the whole IAS market consists of restricted offers.

*This aspect is already covered by the BEREC NN QoS Guidelines through the two-step approach that first evaluates the service offers themselves and in the second step evaluates the availability and penetration of service offers that are not “degraded”.*

Several stakeholders complained about exclusively negative references in regard to traffic management and opposed a *priori* categorisation of traffic management as “reasonable” or “unreasonable”, claiming that any such categorisation should be factual and neutral, taking into account users’ choice and interests. Other stakeholders urged BEREC to clearly define and draw the line between legitimate/reasonable and harmful/unreasonable traffic management practices.

*The BEREC NN QoS Guidelines do not give a negative description of traffic management itself. Since its first published document on net neutrality (the response to the Commission’s 2010 consultation on the open Internet and net neutrality), BEREC has always emphasised that traffic management is needed in order for ISPs to provide good-quality service offers. However, the current guidelines, which look into how to understand “degradation of service and the hindering or slowing down of traffic over networks”, necessarily have to distinguish between two categories of traffic management, one that is covered by this description and another that is not. Reasonable versus unreasonable traffic management is an already established terminology for these two categories. BEREC considers the criteria for distinguishing between the two categories presented in the guidelines clear enough for the time being, and may once again examine whether further clarification may be needed in the future, depending on regulatory developments.*

Various operators were critical about what they perceived as a general preference for application-agnostic traffic management. They claimed that a more neutral stance based on case-by-case analysis would be more appropriate, because in many cases application-specific traffic management measures (especially with regard to congestion) could provide a better experience for users. Other respondents, on the other hand, claimed that traffic management should primarily be application-agnostic and that discrimination between various applications should be prevented, as it could reduce competition and prevent user choice.

*The BEREC NN QoS Guidelines present application-agnostic traffic management as one criterion among others to consider when evaluating practices encountered in the market. This criterion relates to the evaluation of “degradation of service and the hindering or slowing down of traffic over networks” where application-specific traffic management, e.g. blocking or throttling of individual applications, could constitute hindering or slowing down of traffic. Furthermore, Recital 34 of the Citizens Rights Directive explains that “national regulatory authorities may also impose minimum QoS requirements on undertakings providing public communications networks to ensure that services and applications dependent on the network are delivered at a minimum quality standard”, which also points to the prevention of degradation of applications.*

A few respondents commented on the description of the high-level regulatory process, noting that, in order to provide regulatory certainty, it should be harmonised as much as

possible in all Member States and that stakeholders' views should be taken into account through a consultation process before imposing any obligations.

*The high-level regulatory process presented in chapter 3 is further detailed in the following chapters, and this constitutes the recommended approach for NRAs to follow to promote a harmonised regulatory process in Europe. Depending on the particular case, NRAs will typically evaluate the market situation in dialogue with stakeholders, and detailed prescriptions regarding this are not considered necessary in these guidelines.*

### 2.2.3. Chapter 4 - Degradation of Internet access service as a whole

While several stakeholders thought that QoS monitoring by users themselves would provide valuable information, others felt that, because of many factors influencing the potential results (terminal equipment, used applications and software, factors higher up in the supply chain), it would not produce any relevant results. Some were of the opinion that ISPs themselves should be conducting monitoring in accordance with standardised methodologies. Some respondents also expressed the need for NRAs to take responsibility for testing the parameters of IAS on the user side (providing necessary hardware and software).

*The BEREC NN QoS Guidelines describe a broad spectrum of possible measurement methods, emphasising standardised and harmonised approaches, to monitor the offers available in the market. For the time being, NRAs have varying traditions in this regard, and using current measurement tools is a viable way of monitoring the market situation. However, BEREC will in 2013 gather experiences from individual NRAs to build a common knowledge of QoS monitoring that could lead to more harmonised approaches.*

Many respondents stressed the need for both proactive monitoring over longer periods of time to prevent degradation of services as well as reactive monitoring after degradation has already been observed on the market. On the other hand, some operators felt that only reactive monitoring of the quality of IAS on the basis of an objective trigger is justifiable and that any preventive monitoring before a real problem has been identified and assessed would not be proportionate.

*The BEREC NN QoS Guidelines are for the time being considered sufficient in this regard. In addition, proactive quality monitoring is already foreseen in Article 22(2) USD, and should not therefore be excluded. Experiences in the coming years will supplement the current regulatory experience, and development of standards and technology will probably further ease the implementation, which may lead to a need to revisit these recommendations.*

With regard to the monitoring of IAS, one respondent argued that Europe-wide strict and rigid monitoring parameters based on standards and certification mechanisms, combined with the threat of triggering specific QoS measures in cases of non-compliance, could have the effect of becoming de facto horizontal QoS measures themselves, with damaging effects on the effective provision of innovative services. Another respondent stressed that degradation criteria should be carefully evaluated by NRAs on a case-by-case basis, taking into account national circumstances, and should differentiate between fixed and mobile networks.

*The regulatory tool in Article 22(3) USD is provided by lawmakers in order to prevent “degradation of service”, and it is up to the providers to act in a way that makes this tool unnecessary to use, thereby avoiding QoS measures. The comprehensive evaluation procedure described in the BEREC NN QoS Guidelines should sufficiently take all relevant circumstances into account.*

Some operators pointed out that any quality measurements should focus only on the elements of the network that the ISP is solely responsible for (i.e. the aggregation and access network) and should exclude the interconnection leg, which can also be influenced by other players. A few respondents similarly stressed that any monitoring of IAS at the retail level should take into account wholesale market conditions and the ability of the wholesale operator to influence retail offers of operators using its network to provide retail services.

*The former is already clarified in the guidelines: ISPs are also responsible for their interconnection agreements and the way this may be reflected in the advertised speed and effective bandwidth available for Internet communication, even though ISPs can have full control of only their own networks. Furthermore, the guidelines emphasise that statistical methods are indispensable when monitoring performance before imposing requirements, and when verifying after requirements have been imposed, taking into account fluctuations in speed caused by inter-network communication. Regarding the latter, the impact of wholesale services on retail services may have to be taken into account when determining the level of the QoS requirements.*

A few respondents suggested additional quality parameters for monitoring, such as packet loss, delay, jitter, latency, sustainable speed necessary for video, blocking and throttling of data packages. Several operators pointed out that actual versus advertised speed is not a QoS issue and should accordingly never be a trigger for imposition of QoS obligations, but should be dealt with under transparency obligations and consumer protection schemes.

*The quality parameters suggested in the BEREC NN QoS Guidelines are based on common and well-proven quality parameters in use today. Furthermore, the parameters are general, independent of application. Regarding the question about actual versus advertised speed, the guidelines already acknowledge that this is mainly a transparency issue. However, depending on how the advertised speed is specified (e.g. maximum or average value), comparing advertised and actual speeds may give an indication of the congestion level of the service offered to end users.*

Some operators strongly disagreed with the inclusion of performance of IAS compared with specialised services as one of the quality parameters for monitoring. They pointed out that only absolute degradation of IAS itself should be relevant and not the relative degradation in relation to specialised services. In their opinion, specialised services should be seen as completely separate and their evolution or improved performance over time should not necessarily mean that general IAS has been degraded to an unsatisfactory level.

*One reason for using comparison of IAS and specialised services as a quality evaluation method in the BEREC NN QoS Guidelines is to prevent ISPs from leaving IAS behind in technological development while specialised services are being upgraded. However, BEREC acknowledges that there may, in some cases, be a particular need to increase capacity for*

*specialised services in a way which is not necessarily proportionate to the capacity for IAS offers (e.g. introduction of new capacity demanded by specialised services).*

On the other hand, some respondents expressed concern about the effect of the provision of specialised services on the quality of IAS for end users and felt that the evolution of both should be balanced. They supported the comparison of IAS and specialised services as a monitoring parameter to prevent the realisation of the “dirt road Internet” scenario.

*The concept of specialised services in the BEREC NN QoS Guidelines has an important role in market evaluation, distinguishing specialised services from IAS. It is essential that NRAs performing market evaluations avoid a situation in which specialised services are upgraded at the expense of IAS. Further regulatory experience may lead to further clarification on this matter.*

#### 2.2.4. Chapter 5 - Issues regarding individual applications on the Internet access service

As regards restrictions such as throttling, blocking or degradation of certain applications or types of applications, some respondents again insisted that any QoS intervention under Article 22(3) USD should take place only after serious efforts by NRAs to promote transparency and the adoption of effective rules aimed at facilitating ease of switching have been exhausted and proven insufficient to address the identified QoS issues.

*BEREC considers that these aspects are already covered by the BEREC reports on net neutrality. The current guidelines, however, focus on the interpretation of Article 22(3) USD.*

Some operators expressed the opinion that any monitoring of QoS degradation should be considered only in regard to the IAS as a whole and not in regard to individual applications delivered over the IAS. In their opinion, measuring the performance degradation of individual applications would be very difficult to implement in practice, as it would be very difficult to determine the actual source of quality degradation (network deficiencies, interconnection issues, application issues, terminal equipment incompatibility, etc.).

*The BEREC NN QoS Guidelines discuss “degradation of service and the hindering or slowing down of traffic over networks”, which makes it necessary to look into how traffic from individual applications is transferred over networks, and whether specific applications are blocked (hindered) or throttled (slowed down). BEREC acknowledges that detecting throttling of individual applications is a complicated matter; this is covered already in the guidelines and is further detailed in the BEREC NN QoS Framework from 2011.*

Similarly, a few respondents pointed out that imposing any QoS requirements on operators in relation to specific applications would be practically unfeasible because of the enormous number of available applications, and would moreover be unjustifiable and disproportionate. Any regulatory definition of specific applications which should be monitored and for which QoS obligations might be imposed, would be arbitrary, and might lead to regulatory discrimination in favour of specific applications, which could inhibit the performance of all other applications and limit innovation. This would hurt the interests of end users in order to

protect the interests of specific application providers on the market, which should not be the focus of BEREC.

*Even though the BEREC NN QoS Guidelines describe measurement of application performance as one possible way of detecting “degradation of service”, BEREC does not suggest imposing QoS requirements for individual applications. BEREC is aware that this is not feasible on today’s best effort Internet.*

Some respondents stated that contractual restrictions, such as throttling or blocking of certain applications, should not be seen as a QoS issue and should not be addressed through QoS requirements. Providers should always have the option to differentiate their offers, and enhanced competition, transparency and ease of switching are sufficient to protect users from potential anti-competitive and unreasonable practices. Any restrictive differentiation practices should thus be considered as part of competition and transparency analysis and not under QoS requirements.

*The BEREC NN QoS Guidelines describe how to interpret Article 22(3) USD, which leads to criteria for the evaluation of IAS offers as such and within the context of the market, and includes “issues of QoS”, i.e. issues of Article 22(3) USD. These evaluation criteria cover both technically implemented traffic management and contractual restrictions. The criteria also provide a tool for ISPs to ensure that the market does not develop to a point at which regulatory intervention under Article 22(3) USD becomes necessary. Furthermore, IAS offers can also be differentiated on the basis of other parameters, such as bandwidth or data caps, which would not lead to similar net neutrality concerns. Moreover, the selection between different regulatory tools is already covered by chapter 6 of the guidelines.*

Several respondents also opposed the perceived preference for application-agnostic traffic management practices (restrictions) and urged BEREC to adopt a more neutral approach towards restrictions in regard to specific applications, as those are often a more efficient way of ensuring a better overall experience for users (by, for example, temporarily throttling high-bandwidth and applications which are not very time-sensitive).

*As stated previously, the BEREC NN QoS Guidelines describe the application-agnostic characteristic as one criterion among several, and an important motivation for this criterion is that the guidelines elaborate on the evaluation of “degradation of service and the hindering or slowing down of traffic over networks”. Application-agnostic traffic management does not imply that high-bandwidth applications are not throttled. On the contrary, application-agnostic traffic management will throttle applications according to their bandwidth consumption. Regarding “applications which are not very time-sensitive”, these are not easily identified by deep packet inspection or other traffic management methods; for example, P2P applications also include time-sensitive usage such as video streaming, not only background file sharing.*

On the other hand, some respondents stated that blocking or throttling of individual lawful applications or types of applications runs against the Framework provisions with regard to net neutrality, and that a general principle of not restricting individual applications when providing IAS should be established. That is why any traffic (congestion) management practices should be application agnostic, to prevent undue discrimination of certain applications or types of applications.

*The BEREC NN QoS Guidelines set out criteria for the evaluation of IAS offers as such and within the context of the market. However, as stated previously, the Regulatory Framework does not seem to allow for more prescriptive measures.*

#### 2.2.5. Chapter 6 - Determination of regulatory intervention

Respondents warned that premature QoS regulatory intervention could have damaging effects on the market and end users, and once again stated that the threshold for imposition of QoS requirements in accordance with Article 22(3) USD should be high and that it should be viewed as a remedy of last resort. Any such requirements should abide by strict proportionality principles and should be used only in exceptional circumstances, when other less intrusive measures, such as transparency obligations and measures to facilitate easy switching, prove inadequate to address an observed market failure.

*The BEREC NN QoS Guidelines already sufficiently cover these aspects.*

Whereas some stakeholders view harmonisation at the European level as necessary before any regulatory intervention, others stressed that a “one size fits all” solution is not appropriate and that a case-by-case QoS analysis is needed, taking into account all relevant circumstances. The differences between potential QoS requirements in regard to service provided over different types of networks (i.e. mobile and fixed) were particularly emphasised.

*The intention of the BEREC NN QoS Guidelines is to provide guidance to NRAs, facilitating a harmonised approach for use of Article 22(3) USD. However, every NRA will need to take national circumstances or technological characteristics into account when imposing QoS requirements. Regarding harmonisation, the notification procedure should help ensure the functioning of the internal market.*

A few respondents expressed support for the notion of establishing minimum QoS requirements quickly as a temporary measure in cases where it might be considered that fully implementing other regulatory tools will take too much time. Other respondents, though, were concerned by that possibility, deeming it contrary to such measures being last-resort measures which require extensive assessment of the situation before any regulatory intervention.

*Although this will probably not ordinarily be the case, the BEREC NN QoS Guidelines do not preclude using Article 22(3) USD as a temporary measure in special cases. Regarding the need for extensive assessment, this may also be the result of long-term monitoring of the market preceding an incident that leads to the imposition of QoS requirements.*

Stakeholders also emphasised the need to encourage NRAs to put in place appropriate and effective mechanisms for end users, and to encourage content providers or any affected stakeholder to report QoS incidents to the NRAs, so as to enable efficient and speedy action. Furthermore, BEREC should encourage NRAs to carefully monitor compliance with

any imposed QoS measures and also to regularly assess if whether measures are still necessary and adequate or whether they need to be amended or repealed.

*The BEREC NN QoS Guidelines assume that NRAs already have in place appropriate mechanisms for reporting different types of incidents. Regarding the need to verify compliance and possibly removing QoS requirements, this is only briefly described within the current guidelines. However, this phase of the Article 22(3) USD process is the last phase, and further regulatory experience in the interpretation of the provision is expected before this phase is reached in concrete cases. More guidance can then be provided if this is deemed necessary in the future.*

Some respondents also pointed out that QoS measures should be used only to safeguard against active and persistent degradation of the IAS and not to achieve other goals (for example as a substitute for universal service requirements, i.e. in order to reach a desirable level of service). A few respondents concluded that, on the basis of the level of competition in the European markets, the ease of switching between providers and recent strengthening of transparency obligations placed on operators, there is no need for the imposition of QoS measures in Europe at this time.

*The methodology for evaluating the level of degradation leading to imposition of QoS requirements is already described in detail in the BEREC NN QoS Guidelines and further elaboration is not needed. The purpose of these guidelines is only to provide guidance on the evaluation process, not to perform any evaluation of specific cases. Evaluation of the situation in national markets is left to individual NRAs.*

## 2.3. Draft report on assessment of IP interconnection in the context of net neutrality (BoR (12) 33)

### 2.3.1. Chapter 2: Players and business models in the Internet ecosystem

*Question 1: Are there any other important players and/or relationships missing?*

Most respondents generally claimed that no other players or relationships were missing. However, some pointed to the simplifying nature of the categories described by BEREC (see the questions below). In one comment, a broad distinction between retail broadband markets is advocated: national markets where eyeball ISPs compete versus Internet connectivity, with global players on a global market (see also Question 4).

Other views reflected on BEREC's statement that the direction of data flows does not play a role, as incoming and outgoing packets are treated equally. Referring to a video-streaming service, one comment points out that the *request* comes from an application client in a CAU<sup>1</sup> and the traffic then is *initiated* by the CAP hosting the video. The opposite view is taken by another respondent, who claims that traffic in both directions is caused by the same end user, and further stresses more generally that the Internet's existence – the prefix propagation system – ultimately rests on the principle of Bill and Keep. Second, according to this view there is a structural traffic ratio imbalance for incoming/outgoing traffic between eyeball ISPs and the rest of the Internet. According to this respondent, BEREC should confirm that subjecting CAU's aggregate Internet usage to limited/restricted transit or peering capacity constitutes a violation of net neutrality. Thus, IP interconnection must be *congestion free*. Third, this stakeholder stresses the need for substitutability between transits, peering, CDNs and IXPs, and that transit should always be provided in the *same home market* as direct peering. The respondent states that these three issues – causality of traffic, structural traffic ratio imbalance and competitive methods of content distribution – require more emphasis in the report (*as this reasoning relates to other issues, see in particular also Questions 7 and 8*).

Arguments relating to BEREC's Figures 2 and 3 were received, in which two stakeholders argued that CDNs should either operate at multiple levels, i.e. not just the application layers, or that they should even be moved to the network layers. Another stakeholder claimed that the CDN area in the figures should be moved to the CAP side, as the current figure seemed to imply that CAUs were customers of CAPs.

More specific arguments were mentioned by one stakeholder, according to whom device manufactures may also be mentioned.

*BEREC considers that it has addressed the most important players, and that the relationships relevant in the context of IP interconnection are already covered.*

*Regarding the question of 'who causes the traffic flows', BEREC maintains its position that it is ultimately the CAU who requests the data and that by this the traffic flow from the CAP towards the CAU is initiated (see new Ch. 4.8).*

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<sup>1</sup> Content and Application User: this term relates to residential (private) users and business users of broadband/Internet access in their function of *passively consuming* content.



*Concerning the figures, it is not considered appropriate to generally shift the CDNs to the network layer. This would give the impression that every CDN operates a network. It is not considered necessary to add device manufacturers in this paper addressing interconnection issues.*

## Chapter 2.1: Content and Application Providers

*Question 2: Do you agree with the classification of CAPs as outlined above?*

There were several replies received with regard to CAP classification as opposed to CAUs. The replies to this question are closely related to the Question 3 replies (see below). Most of the comments either generally agreed and/or stated that the classification is simplistic as an entity may be simultaneously active in more than one role. In fact, as pointed out in one comment, end users also acted as CAPs when they provide blogs, for example. One respondent points out the fact that BEREC itself had noted this simplification. Another considered the distinction between CAPs (wholesale) and final users (retail) to be important. The separation of application and network layers enables CAUs to also produce content, as pointed out by one stakeholder.

With regard to legal classification, one stakeholder stated that Chapter 2 seems to suggest that it is possible to divide Internet players into separate categories sufficiently distinct to possibly warrant different regulatory treatment. Another stakeholder concludes from the end user definition in Art.2n FD that both categories, CAU and CAP, fall under this generic end user label. One telco claimed that CAPs should be subject to the general authorisation regime. Furthermore, CAPs should be considered as providers of ECS, and as CAPs using their own infrastructure as network operators.

The views received on costs of CAPs were as follows. Some stakeholders commented on BERECs general statement '*(CAPs) do not currently make any direct payments to the ISPs providing connectivity to CAUs*'. Two comments reasoned that, although CAPs generally do not make such payments, there may be a few – perhaps growing in number – that make payments to eyeball ISPs (e.g. through revenue sharing). However, the commercial relationship between CAPs and ISPs may involve payments in both directions (e.g. advertising or content partnerships). More specifically, two stakeholders defended the view that a CAP may make payments to ISPs for paid peering if it has internalised network function normally provisioned by other parties. Also, if a CAP uses a CDN, this CDN may then pay an ISP for delivery of traffic (to this ISP).

Another argument related to broadcasters, who should also be mentioned, according to one stakeholder, who suggested 'Live and on-demand radio and video services, e.g. broadcasters'.

*As with the other players described in Ch. 2 of the report, BEREC is fully aware that CAPs encompass a variety of different players. Furthermore, entities may operate in more than one specific role. BEREC had referred to the overlaps between CAUs and CAPs (see BEREC's considerations on Question 3 below).*

*Given that the report rather addresses economic issues, a (generally valid) legal classification of CAPs, or any other types of players, is beyond the scope of this report. Furthermore, BEREC specifies in Ch. 2.1 d) ('Costs') that CAPs typically do not make payments to ISPs.*

*Broadcasters are now added to the examples of CAPs mentioned in Ch. 2.1 e).*

## Chapter 2.2: Content and Application Users

*Question 3: Do you agree with the classification of CAUs as outlined above?*

There were several replies received with regard to CAP classification as opposed to CAUs. Overall, the replies to Question 3 were very similar to those provided for Question 2. Several comments broadly agreed with the classification presented; however, some also referred to the simplifying nature of this classification, either because there are different CAUs or because of the large variety between CAUs and CAPs or overlaps between the categories CAU and CAP. Regarding the first argument, one respondent claimed that the term CAU failed to recognise the difference between mass market (residential) end users and multisite (small, medium or large) users, which have different and more complex connectivity needs. Others addressed the difference between CAUs and CAPs, arguing, for example, that using the Internet for productive purposes does not make a CAU a CAP. On the other hand, one stakeholder claimed that a clear distinction between CAUs and CAPs is not possible. More specifically, one stakeholder reasoned that the CAU classification fails to distinguish between end users and content providers in the case of P2P services. According to this view, such P2P services are neither set up nor released by the end user downloading the content. It then calls for a clear distinction between end users and service providers, and states that BEREC should use the 'user-definition' of Art. 2 AD. Two respondents consider the statement that 'services provided by the CAUs would not have been possible without the Internet and ... the separation of application and network layers' as too apodictic. Such services/applications are also provided if these layers are linked to the network layer. In direct opposition, another stakeholder calls upon BEREC to explicitly recognise that this separation enabled CAUs to also produce content.

With regard to legal classification, another stakeholder concludes from the end user definition in Art. 2n FD that both categories, CAUs and CAPs, fall under this generic end-user label.

According to one respondent, the cost paragraph on CAUs should consider the fact that a lot of DSLAM connections to the CAUs are overlooked, as this is an important factor in ISPs' pricing for CAUs, also constituting a bottleneck.

*BEREC reiterates that it has used the term 'content and application user' as referring to the function of passively consuming content. It was already pointed out (Ch. 2.2 b, 'Further*

*functionalities') that there are some overlaps between CAUs and CAPs. Furthermore, BEREC had already stated that CAUs encompass different entities, residential users as well as business users. Obviously, the latter can differ with regard to their size, for example.*

*Thus, BEREC considers that for the purpose of this report it is appropriate to use the term CAU in this way. This enables a generic juxtaposition of the functionality of 'consuming content' (CAU) and the functionality of 'providing content/applications' (CAP).*

### Chapter 2.3: ISP (network providers)

*Question 4: Do you agree with the classification of ISPs as outlined above?*

With regard to the classification of ISPs, some respondents noted that players typically operate within multiple categories. More specifically, it was pointed out in a comment that bigger players such as incumbents could also own a CDN. Two comments suggested dividing ISPs into retail and transit ISPs. Two comments stated that the presentation is reasonable and that BEREC itself had referred to the overlaps.

Another stakeholder noted that in the report the category of transit ISPs distinguishes between 'backbone ISPs' and 'other ISPs'. However, both would operate on the global wholesale connectivity market. Thus, they might be regarded as one entity, or a distinction between Tier 1 and Tier 2 ISPs could be made.

A common ISP classification across the BEREC documents was suggested by one respondent. More generally, this respondent referred to the growing influence of CAPs, thus considering it short-sighted to analyse ISPs as the core of the net neutrality issue.

More specifically, one respondent stresses that only with route multiplicity could end users benefit from falling transit prices. According to this view, route multiplicity directly results from multi-homing and multiple route propagations by transit providers through their clients and settlement-free peers.

A view was expressed on legal classification, whereby one respondent holds that networks over which specialised services are provided constitute open, and not closed, communications networks. Another pointed out that ISPs provide retail services, but generally do not install or manage public networks.

Other arguments specified that MVNOs should also be included in the chapter on ISPs, and their implications be examined. The term 'eyeball ISP' was criticised in a comment, as it seems to justify access network operator claims for deriving revenues for the termination of Internet traffic from CAPs.

Replies relating to costs of ISPs included the following views. One respondent considered that the cost section was highly simplified and called for the costs of transmission links to be taken into account. Two comments pointed out that eyeball ISPs incur costs for investment and operation of domestic retail networks. Another stakeholder called for a section on costs and revenue for those ISPs that provided access to CAPs. One respondent reasoned that the fact of overbooked DSLAM connections to the CAU is also relevant in the cost paragraph on eyeballs.

*The distinction between eyeball ISPs and transit ISPs is already reflected (separate bullet points) in Chapter 2.3. BEREC clarifies that the category of transit ISPs encompasses ISPs of different sizes (tier 1/tier 2). However, it points out that the category of 'other ISPs' should still be distinguished from the backbone ISPs, as the former 'predominantly provides connectivity to CAPs'.*

*Regarding the cost positions, BEREC emphasised that it did not intend to provide a comprehensive list of all cost factors relevant for an ISP, but to focus on the cost positions that are relevant in the context of interconnection. BEREC now specifies that an ISP that provides access networks incurs costs for these networks (Ch. 2.3, bullet point on 'Costs').*

*BEREC considers that the cost positions incurred by an operator providing access are already correctly described. However, it is clear that the costs may differ in size depending on whether access is provided for a retail end user or a CAP. Accordingly, this line of argument also holds for the revenues.*

*BEREC does not support the argument that networks used for specialised services constitute public communications networks.*

*It is now reflected in the chapter on ISPs that this category also encompasses MVNOs (footnote added to the box generically defining ISPs).*

#### Chapter 2.4: Content Delivery Networks

*Question 5: Do you agree with the classification of CDNs as outlined above?*

General classification of CDNs can be summarised as follows. Most comments pointed out that there is a variety of different CDNs, which may also overlap. Thus, it would be hard to make a general category of CDNs. Ultimately, they rather consider the classification provided as simplistic. However, one respondent acknowledged that BEREC itself had referred to this simplification. Others generally agreed with the classification provided. One respondent stressed that CDNs are often paid by broadcasters for hosting services relating to video distribution and encoding/transcoding, and that CDNs are not paid for optimising data flows relating to distribution of media content over the Internet.

With regard to legal classification, a few respondents took up the question of the legal classification of CDNs. One called for clarification by BEREC that CDNs did not constitute ECSs or ECNs. Two comments referred to CDNs operating their own networks. One respondent reasoned that, because CDNs install and manage network facilities, they should be classified as network operators for the purpose of the application of rights and obligations set by Arts. 4 and 6 AD. Another respondent, while seeing the classification of CDNs as ECSs or ECNs as depending on the individual case, considered CDNs to rather constitute ECSs, as they rarely operate public networks.

Views on billing metrics were expressed by a few stakeholders who referred to the revenues of CDNs, pointing out that their services are billed on a basis of 'per MB delivered' rather than 'per MB consumed'. One respondent claimed that, although the peak bandwidth parameter (MB/s) is the most common parameter, volume is increasingly commonly used

(MB/month). Related to this, another respondent claimed that billing is mostly done on a per MB basis (i.e. total volume of data transmitted) and not per MB/s as claimed by BEREC.

*BEREC is aware that CDNs do not constitute a homogeneous category, as they may perform different functionalities, and CDNs are provided by different players. This was already pointed out by BEREC in Ch. 2.4 f). BEREC has elaborated on the legal classification of CDNs (Ch. 2.4 c)), referring in particular to some studies carried out on this issue by/for different NRAs. Reflecting the different types of CDNs – some do not operate networks, while others do – BEREC does not consider it appropriate or even possible to make a legal classification of CDNs without looking at each individual case. Against this background, BEREC holds that its description of CDNs in Ch. 2.4 is appropriate.*

### 2.3.2. Chapter 3.2.1: Rationale for peering

*Question 6: To what extent are requirements regarding traffic ratios still important in free peering arrangements?*

While the replies range from ‘usually not important’ to of the ‘utmost importance’, several stakeholders considered traffic ratios to have some relevance without being the sole factor of relevance.

One of the respondents reasoned that large eyeball ISPs used peering ratios in order to refuse peering and to extract payments. Another respondent considered that there is no place for traffic ratios if *different* kinds of networks interconnect. At the other end of the range of opinions expressed, one stakeholder reasoned that ratios are of the utmost importance to prevent free-riding.

Some respondents expressed the opinion that peering needs to be mutually beneficial or, as stated by one respondent, peering needs to reflect the cost-benefit ratio for the parties concerned. One stakeholder concluded that if there were such a mutual benefit this would make ratios less relevant (3G).

In some comments it was pointed out that peering is based on a *relative* traffic symmetry. Further elaborating on this point, respondents stressed that peering gives rise to costs and that billing is disclaimed if traffic is sufficiently balanced.

One respondent referred to an increase in traffic asymmetries, implying that one party incurs more costs than the other. In this reply it was argued that the cost of this symmetry could not be shouldered by end users who did not have control over the traffic sent to them by service providers.

Some stakeholders mentioned other factors that also played a role such as routing policies (hot/cold-potato routing) or points and location of interconnection.

Furthermore, an incumbent referred to its selective peering policy and called for ‘value-based interconnection’.

*BEREC considers that, in practice, traffic ratios have some relevance in free peering agreements as well as other factors such as (rough) bit-mile parity, routing policies and the*

*location of interconnection points. Considering the replies received, BEREC considers that it has correctly described the peering requirements in Ch. 3.2.1. The relative importance of all these factors may differ depending on the individual peering agreement. Furthermore, BEREC recalls that the vast majority of peering agreements are of a more informal nature.*

*Question 7: To what extent does the functioning of the peering market hinge on the competitiveness of the transit market?*

All the respondents considered the peering and transit markets to be related and complementary to one another. Some opinions received by national-level operators stated that, in particular, regional peering makes the transit market more competitive, and peering agreements contribute to an improved performance compared with transit services.

Another stakeholder even reasoned that the functioning of the peering market entirely depends on the substitutability of transit. According to this view, there are three conditions for transit to always be an effective default option. Interconnections must be congestion free, local and end users' prefix propagation must not be artificially withheld.

Regarding free peering relations with broadcasters, one of the stakeholders pointed out that these are more beneficial for ISPs than the reduction in transit income generated from broadcasters.

*BEREC recalls that peering and the transit markets are closely interrelated. For an ISP that fulfils the requirements for peering, these two forms of interconnections (transit and peering) constitute substitutes. On the other hand, an operator not fulfilling these requirements does not have this choice and thus relies on a competitive provision of transit. In practice, transit prices have been subject to a constant decline, indicating that transit markets are competitive.*

*In the light of the comments received, BEREC considers its explanations in Ch. 3.2.1 addressing, inter alia, the relationship between peering and transit, to be correct.*

### Chapter 3.2.2: Further types of peering arrangements

*Question 8: Does an imbalance of traffic flows justify paid peering?*

Most of the comments received were assessed as positive. Nonetheless, there were also some negative replies, stating that, in relation to some modern practices, traffic imbalance becomes irrelevant, paid peering does not require justification, and the imbalance of traffic flows does not imply which one of the parties involved in the peering has the highest interest in the peering itself. One national-level operator pointed out that it depends on the specific case, and provided an example. In one comment it was argued that *paid* peering is just one method alongside transit and CDNs, and that the market dictates whether a payment is needed. This respondent also stressed that traffic flows (eyeballs to the Internet) are structurally unbalanced.

One of the stakeholders reasoned that paid peering is 'not unlike' the principle of Sending Party Network Pays.

*BEREC recalls that traffic ratios are one factor determining whether a peering agreement is settlement-free or whether payments apply. Thus, if the traffic imbalance exceeds a certain threshold, in practice this will often imply that paid peering applies. However, as pointed out in Question 6, other factors may also play a role (such as bit-mile parity). This is taken up by BEREC in Ch. 3.2.2, in the subsection on paid peering.*

*BEREC does not support the argument that paid peering and the principle of Sending Party Network Pays (SPNP) are similar. The Internet protocol governing the Internet is a connection-less protocol, implying that at the IP layer there is no information available on the relationship and direction of a flow of packets. Interconnection of packet-switched networks cannot rely on service-based information or service instances (calls). The criterion for charging of IP interconnection is generally the capacity at the interconnection point. Consequently, interconnection agreements involve only conditions of access to and the capacity of the interconnection interface. This consideration is reflected in Ch. 3, as well as in the new Ch. 4.8 in BEREC's report.*

*Question 9: Does paid peering increase (number of contracts and volume handled under such contracts)?*

Most of the respondents shared the view that paid peering increases either the number of contracts or volume, if not both. Even though this was not based on facts, some stakeholders and operators expressed their opinion in favour of the increasing trend of paid peering as an attractive service. Furthermore, one individual's detailed view allows the conclusion that in the absence of paid peering the provider would opt to roll out all its traffic into transit or decide on a settlement-free peering relationship. Nevertheless, some operators highlighted the contrast between the increasing number of paid peering contracts and overall traffic growth, which still takes the lead ahead of paid peering, as well as referring to paid peering as not relevant.

*In the light of the comments received and in particular given the 'private' nature of peering agreements, BEREC considers that evidence on whether there is a trend towards paid peering is rather anecdotal. This point is newly taken in Ch. 3.2.2, in the subsection on paid peering.*

*BEREC clarifies in Ch. 3.2.2 (subsection on paid peering) that the percentage of paid peering agreements – which is estimated at 0.27% of all peering for 2011 – does not allow an assessment of the quantitative relevance of the volumes exchanged under peering contracts.*

*Question 10: To what extent does regional peering increase in relevance and affect transit services?*

In response to the above question, several comments were received covering various topics in the light of regional peering showing an increasing trend. A global stakeholder adopted the view that, for broadcasters, regional peering increases in relevance, while another considered the former statement to be applicable in general if paid peering becomes more prevalent. Other views of operators saw increasing regional peering in the case of

decreasing transit demand, considering regional peering to be mainly relevant for regional content, as well as the importance of regional peering fostering competition relating to the transit market. In particular, one of the operators further specified that it is reasonable to increase the peering component up to a certain percentage (40% to 60% of external bandwidth, depending on granularity) in order to guarantee that the transit component can support a fault on a peering path.

*In the light of the comments received, BEREC considers that there is no clear-cut tendency towards regional peering. However, considering the findings presented in Question 17, one could expect that the (general) tendency towards regionalisation of traffic is accompanied by an increase in regional peering. However, clear empirical evidence on this is lacking. Ch. 3.2.2, the subsection addressing regional peering, is adapted accordingly.*

### Chapter 3.2.3: Internet Exchange Points (IXPs)

*Question 11: Are any important services missing from the list of services provided by IXPs?*

In conclusion, stakeholders providing feedback to this question agreed with BEREC's approach covering all important services. However, one of the national-level operators highlighted the significance of granting the possibility of best effort and an end-to-end QoS delivery. Furthermore, another operator suggested modifying the ISP definition to a so-called Autonomous System, a more general term reflecting the participation of other entities in the IXPs.

*BEREC acknowledges that IXPs may provide further functions/services other than their generic functions of public or private peering. This may be the route server, DNS and root name servers, routing tools or services ensuring QoS, for example. See newly added subsection 'Further functionalities IXPs may provide' in Ch. 3.2.3.*

*Question 12: Are there any further developments regarding IXPs to be considered?*

The majority of comments from national-level operators, global stakeholders and individuals on this topic indicated that the draft report addresses the situation of IXPs appropriately, and there are no further developments to be considered in this respect. Nevertheless, one of the operators mentioned IXPs forming consortia resulting in expansion of their activities from local to regional level. Another operator highlighted the importance of QoS to be considered in this respect, and drew attention to the declining interest in IP Multicasts. Finally, it is worth mentioning that one of the respondents referred to improvement in light of increased choice, competition, changes in inter-/intra-regional traffic flows, efficient network usage, investment growth and network performance as a consequence of the expanding use of IXPs.

*Taking into account the comments received, BEREC considers that the main developments have been correctly described. However, it has taken up the point that some IXPs have started to interconnect or to form partnerships (see subsection on 'Further functionalities IXPs may provide' in Ch. 3.2.3. and the subsection on 'Development of IXPs' in Ch. 4.1).*

*Question 13: Should in future Europe evolve to have more decentralised IXPs closer to CAUs?*

On the one hand, an individual respondent and a national-level operator stated that Europe is already evolving in this direction, while, on the other hand, some operators did not expect IXPs to make significant progress in the future. Another two national-level operators



coincided in their opinions, stating that future evolution hinges on economic justification as well as specific circumstances that can trigger a market response in the form of further development of additional IXPs. In addition to the above, one of the global stakeholders tended to adopt a different view on the necessity of more decentralisation of IXPs, stating that distance is not a cost driver and that central IXP already allows interconnection with many players. Finally, it is worth mentioning that one stakeholder suggested a right for colocation, enabling CAPs to install caches or edges as close as possible to the CAUs, thus allowing CAPs to run their own CDNs. There were also some general views received, including the view of global stakeholders and one operator stressing the need to respect the NN principle, as well as highlighting that the market is moving to regional IXPs and, lastly, the possibility that the above-mentioned trend will generate advantages in decentralised network topologies.

*In the light of the comments received, as well as the literature (e.g. Analysys-Mason, European Internet Exchange Association), BEREC considers that there is a certain trend towards a regionalisation of IXPs (see the newly added subsection 'Developments' in Ch. 3.2.3. This can be concluded from the increase in the number of IXPs over time, both in Europe as well as in other regions of the world.*

*BEREC points out that this development is mainly due to two reasons: improved network performance (e.g. lower latency) and economic factors (savings in upstream payments to transit providers). It should be noted that this development was market-driven. However, any developments occurring need to be in line with the regulatory objectives and the principles of the Framework.*

### Chapter 3.3: QoS interconnection

*Question 14: Will traffic classes ever become available in practice on a wider scale?*

Several respondents – mainly telcos – considered that traffic classes will be deployed on a wider scale, or even saw this as a necessity. Because of the expected growth in quality-sensitive services and business models, they stated that the need for QoS-differentiated IP interconnection would increase. One respondent pointed out that DiffServ has already existed for many years; however, priority levels are currently not implemented in a harmonised way. Following this reasoning, some stressed the importance of standardisation for global QoS.

Some who argued in favour of QoS doubted that simply increasing bandwidth was sufficient. According to this view, the emergence of CDNs has shown that there is a demand for QoS. CDNs or vertical integration of CAPs would not have emerged if increasing bandwidth were sufficient. One respondent even doubted that traffic classes could introduce incentives for quality degradation of the best-effort Internet.

Although QoS will become a reality, for several respondents the question was whether QoS traffic classes will emerge on the Internet or will appear only in parallel and managed IP networks. Another stakeholder pointed out that specialised services may use specific transport resources or also the IP transport layer of the public Internet, or both.

Other respondents were rather critical regarding the widespread deployment of traffic classes. They did not see a real need for traffic classes and/or stressed the complexity and

costs of guaranteeing QoS. One incumbent did not even see a need for traffic classes across the public Internet.

Some of these respondents reasoned that increasing bandwidth is a viable strategy and furthermore pointed out that QoS provides incentives for quality degradation to induce a willingness to pay for QoS.

More generally, one stakeholder considered a strict interpretation of the net neutrality principle to be misleading, as this was tantamount to equating net neutrality and best effort and giving QoS a negative connotation.

*BEREC considers that the question as to whether traffic classes will be available on a wide scale hinges upon several issues: on the availability of applications and services that require a guaranteed quality and on users' willingness to pay for such traffic classes. Furthermore, the economic viability of a strategy to implement traffic classes is also affected by the transaction costs of implementing, monitoring and enforcing traffic classes. BEREC reiterates that QoS interconnection with guaranteed traffic classes has been discussed already for many years by network providers without having been implemented in practice.*

*It also depends on to what extent (and at what costs) other solutions (e.g. CDNs, IXPs) contribute to improving QoS (see Question 16). Finally, the costs of simply adding more bandwidth also impact on the economic efficiency and viability of introducing traffic classes (see Question 19 on cost reductions).*

*In the light of the comments received, BEREC has included some explanations outlining the fundamental differences between circuit and packet-switched networks (see the beginning of Ch. 3) and clarifying how the concept of QoS relates to the connectionless nature of the Internet protocol (see Ch. 3.3).*

*BEREC points out that, in any case, the provisions and principles of the Framework (e.g. Art. 22 (3) USD) must not be violated if traffic classes become available in practice.*

*Question 15: Will interconnection for specialised services be provided across networks?*

Several replies reasoned that interconnection for specialised services will be provided across networks. Some of these comments even pointed out that for some cases this is already happening today. VoIP over NGNs was mentioned as an example of such interconnection either existing or being developed.

One stakeholder stressed the need for IP-based interconnection at the SolX (Service-oriented Interconnection) service-level in order to guarantee predefined quality levels for each end-to-end communication. According to this respondent, SolX needs to be distinguished from Connectivity-oriented Interconnection (CoIX).

Another respondent argued that, within the transit layer, interconnection for specialised services is difficult to provision, monitor and enforce, while in the access networks a need for guaranteed QoS might emerge if networks become congested.

One respondent pointed out that networks have no control over incoming traffic, which implies that QoS cannot be 'imposed' on traffic received from the Internet. QoS across networks was possible only if it was enforced on all CAPs. Another comment, while generally

being rather sceptical about traffic classes, pointed out that the cost of implementing interconnection for specialised services might be lower than for traffic classes.

*Specialised services are provided and operated within closed electronic communications networks relying on strict admission control. The question as to whether interconnection for specialised services will be provided across networks is governed by factors that also impact on the viability of traffic classes (see Question 14).*

*Regarding the argument that BEREC should consider the distinction between SoIX (Service-oriented Interconnection) and CoIX (Connectivity-oriented Interconnection), BEREC refers to its explanations on the separation of network (transport) and application (service) set out in the 'ERG Common Statement on Regulatory Principles of IP-IC/NGN' (ERG (08) 26) (see also ERG (07) 09, Ch. A.1.3, for further descriptions of the concepts of SoIX and CoIX). Accordingly, BEREC has added a reference (the footnote in Ch. 1) to these explanations.*

*According to the ETSI/TISPAN definition, SoIX encompasses service-related signalling as well as transport-related information, while the concept of CoIX refers to transport resource, i.e. in the absence of any service-related signalling. BEREC points out that – unlike this ETSI/TISPAN definition – it understands application (service) interconnection solely as including service-specific aspects.*

*BEREC points out that in any case the provisions and principles of the Framework (e.g. Art. 22 (3) USD) must not be violated if interconnection for specialised services is provided across networks.*

*Question 16: Will other solutions for improving QoE like CDNs become more successful rather than traffic classes?*

Although several positive comments have been received from various stakeholders on the success of CDNs, explicitly highlighting their profitability from the perspective of maximising data throughput, effectiveness in a managed lane and making best-effort Internet more efficient, they themselves also drew special attention to other technical solutions that could contribute to improvement of QoE, such as transparent and/or open caching, multicasts and developments in OTT video-encoding methodologies. Notwithstanding the above, one of the global stakeholders expressed its view that CDNs are unable to solve congestion problems, thus hampering full achievement of the benefits of QoS traffic classes. Moreover, the clear distinction between the suitability of CDNs for storable content on the one hand and WoS classes for non-storable content on the other, (comprising e-health and individual cloud services) was also stressed by national-level operators. One of these operators also mentioned direct connection of hyper giant networks to the eyeball ISP as a best solution in case of services that can be cached or that are simultaneously received by a number of CAUs. There have also been operators representing diametrically opposed views, stating that further decentralisation of services, namely expanding CDNs, is the only method, in contrast with the opinion that traffic classes and CDNs should not be viewed as competing entities and that other possibilities exist.

*BEREC holds that CDNs have contributed to enhancing an end user's perception of an application's quality (QoE). Furthermore, BEREC acknowledges that the concept of CDNs is more appropriate for certain applications or services (e.g. distribution of software updates)*

*than for others (e.g. content which cannot be cached). Given this, it is recognised that CDNs are one tool for improving QoE.*

*Given the unforeseeable nature of technical progress, it cannot be assessed with sufficient clarity whether or to what extent compression technologies, codec optimisation or any other technical concept will play a bigger role in the future.*

*Generally, the economic pressure to develop further solutions that will ultimately improve end user experience also depends on the costs of deploying more bandwidth in the networks (for this, see the newly added evidence on decreasing costs in Ch. 4.2.1). To put it bluntly, if bandwidth is cheap this (ceteris paribus) relatively decreases the economic viability of other concepts.*

### 2.3.3. Chapter 4.1: Traffic evolution

*Question 17: Which of the factors impacting on the regionalisation of traffic is most important: language, CDNs, direct peering?*

Most of the respondents considered that all three factors have an impact on the regionalisation of traffic. On the one hand, one national-level operator specifically commented that language was the most important factor, while, on the other hand, one of the stakeholders in particular excluded the influence of language. Some – individuals, operators and global stakeholders – highlighted the importance of CDNs as a factor for more regional traffic. In the view of another operator, flattening of traffic exchange does not mean regionalisation. Furthermore, the informant went on to explain that direct traffic exchange occurs, but that this may or may not be close to the final customers.

*In the light of the comments received, BEREC considers that all these factors contribute to a further regionalisation of traffic and that they may relate to each other. In addition, this clarification provides some evidence that there is a certain tendency towards regionalisation of traffic (see subsection on ‘Regionalisation of traffic’, Ch. 4.1).*

*Question 18: Are any further issues missing?*

Regarding any further missing issues, two suggestions were received about vertically integrated operators and IP Multicast, which failed on inter-ISP transport. A global stakeholder supported its view by further clarifying that vertically integrated operators have no interest in strictly separating the accounting of the internal content services from the transport cost. An example from one individual stated that the new undersea cables to Africa are opening up that market, and therefore a massive shift is expected in traffic currently transmitted via satellite. Despite the fact that some of the national level operators found the issues covered by BEREC sufficient, in particular drawing on the statistical and forecast data, another operator expressed disbelief in BEREC’s ‘rate of growths showing a slight decline’ – expected traffic growth: 40%/35% p.a. mobile/fixed. One of the operators expressed the opinion that the global IP traffic development forecasts presented in Figure 5 may be underestimated from 2011 onwards.

*Considering the comments received, BEREC holds that Chapter 4.1, ‘Traffic evolution’, has correctly described the main developments.*

## Chapter 4.2: Pricing and costing developments/Chapter 4.3: Revenue flows

Question 19: Given the cost reductions and the economies of scale and scope observable in practice, why do network operators call for compensation?

Several respondents referred to the (expected) traffic increases and stressed the need for operators to generate corresponding revenues, as this increase was not offset by a decrease in costs. One of these stakeholders considered that, regarding the relation between volume increases and cost decreases, there is a 'high risk of errors' and, more generally, doubted that the cost decrease will continue forever. Another comment considered Cisco traffic projections to underestimate traffic developments.

These respondents stressed the need for network investments in order to cope with traffic growth. Given the limited growth in the number of users, revenues would not increase in line with the increase in traffic. These stakeholders considered that CAPs' OTTs would free-ride at the expense of the telcos. According to this view, there is no incentive to use bandwidth efficiently.

More specifically with regard to the costs, one stakeholder mentioned significant incremental costs, of which transit costs are only a very small part. For mobile networks, incremental capacity costs are '100 to 1 000 times' higher. This stakeholder called for deletion of the statement that the decrease in unit costs is not over-compensated by the increase in volume, as well as the sentence 'unit cost declines are mainly relevant in core/aggregation networks and in mobile networks'.

Two respondents argued that capped flat rates are not viewed as a solution to offset cost increases. They also referred to the concept of two-sided markets and the fact that revenues could be generated from both sides.

Some of these rather critical respondents called BEREC to consider other studies as well to provide a more nuanced view. One of them holds that the WIK study quoted by BEREC did not see a need for specific financial compensation. The other referred to ARECP results which led to results different from those in the WIK study.

A diametrically opposite view was taken by other stakeholders. They subscribed to the analysis provided by BEREC and its conclusions on pricing, costing and revenue developments. One incumbent – while arguing that economies did not offset costs associated with the increase in traffic – did not see evidence of the explosion in costs, pointing out that ISPs could also encourage CAPs to use the Internet efficiently, by caching their content on ISP networks.

According to their view, unit cost decreases offset the increase in traffic. These respondents did not consider a free-riding problem to justify payments from CAPs towards eyeball ISPs. One of these respondents concluded that the net neutrality debate was rather a debate about reallocation of income between providers of hosting and connectivity on the one hand and providers of end user connectivity on the other.

*In the light of the comments received, BEREC has substantially updated Ch. 4.2.1, providing further evidence and referring to other studies and calculations. In particular, BEREC has*

*further examined the study from AT Kearney and assessed its conclusions. Furthermore, BEREC has added some new WIK calculations for Germany and has also reflected the findings from ARCEP provided in their net neutrality report to the Parliament. Some further evidence on CAPEX projections was also added.*

*Against the background of these findings, BEREC confirms its statements on cost decreases and states that they (broadly) offset the (expected) increase in traffic.*

*As regards mobile networks, BEREC had acknowledged that capacity restrictions play a greater role than in fixed networks. A new paragraph was added in Ch. 4.2.1 in the subsection on mobile networks, indicating that these traffic-related costs are approximately 10 times higher in mobile networks.*

*More specifically, BEREC does not consider it appropriate to delete the sentence that 'unit cost declines are mainly relevant in core/aggregation networks and in mobile networks' as the costs in the last mile are mainly driven by the number of users.*

#### Chapter 4.4.4: Increasing role of CDNs

*Question 20: Do you subscribe to the view that CDNs lead to improvement of QoS without violating the best effort principle?*

In general, several stakeholders subscribed to this view, for example arguing that CDNs reduce latency and jitter or, more generally, that the Internet was not sustainable without CDNs. Others did not clearly reject this statement, but stated that CDNs do not serve as a substitute for QoS, or are only one possible method.

Some respondents referred to the difference between QoS and QoE. CDNs could only improve QoE. Two of the respondents explicitly rejected the view expressed in the question, since CDNs could only improve the QoE of an end user for a limited set of storable content services (for this argument, also see Question 16).

The best-effort principle was addressed as follows. One stakeholder argued that neither CDNs nor CAPs have the ability to interfere with the routing of entities' traffic as they cannot make packets go faster at the last-mile router. Another agreed to the question, as long as a CDN did not exploit an exclusive arrangement with an ISP or implemented differentiated QoS on content delivered via that CDN through the ISP.

Two respondents argued in a more general way, stressing that 'best effort' was not a concept used in the Framework. Furthermore, they stated that QoS and 'best effort' complemented each other.

*BEREC considers that CDNs typically do not lead to a violation of the best-effort principle. This holds, in particular, where a CDN operates only on the application layer (see Figure 2) and not simultaneously on the network layer, i.e. the CDN does not operate its own network and thus does not exert any influence on the transport of packets.*

*Furthermore, BEREC clarifies that CDNs improve QoE (this was already pointed out in the first bullet in Ch. 4.4.4).*

*Question 21: Is there a trend for CDNs to provide their own networks (i.e. integrating backwards)?*

Several of the replies to this question adopted a general view that did not see such a (systematic) trend. One comment pointed out that no CDN that started without a backbone is building a backbone. Two argued that this may depend on the size of the CDNs and that the big ones may have economies. Another considered a worldwide CDN as de facto operating an overlay network with logical connection across its systems.

With regard to other integration developments, a few comments rather pointed out that there is another integration process under way, namely backbones becoming CDN providers. Two stakeholders referred to backward integration by major content providers, i.e. those content providers that also operate CAPs are investing in network capacity.

Other replies went beyond the question. One comment claimed that the risk that better quality could be reserved for CAPs operating own networks was not explored enough.

*Considering the variety of operators providing CDN functionalities, there is no systematic trend of CDNs providing their own networks. It seems that other providers more often integrate forward, i.e. start operating their own CDNs either for their own use or to provide services to others.*

#### Chapter 4.5: Flattening of network hierarchies

*Question 22 (Chapter 4): Is there a general tendency for eyeball (CAU) ISPs to deploy their own transit capacities and long-distance networks or even become Tier-1 backbones?*

Some of the stakeholders did not see such a general tendency. Others reasoned that only a small number of big eyeballs achieved Tier-1 status, but they came to different conclusions about whether this constitutes a tendency. One deduced from the number of Tier-1 networks, which has increased in recent years, that there is such a tendency, while another reasoned that this growth was too small to draw this conclusion.

Somewhat differently, one of the respondents holds that some incumbents achieved their Tier-1 status by unduly leveraging their SMP position in the retail market. According to this view, these operators forced their eyeball ISP operations to buy transit exclusively internally. Therefore, those eyeball ISPs are single-homed to their internal transit division, which becomes unavoidable as their access division. Thus, there are no alternative routes to reach this eyeball ISP (because of the exclusivity granted to the transit division).

*BEREC observes that several large eyeball ISPs have acquired Tier-1 status. However, because of the absolute number of Tier-1 providers currently existing, this could tentatively be assessed as a certain tendency.*

*For these large providers, deploying their own transit capacities and long-distance networks may be a strategy which presumably is not viable for smaller eyeball ISPs.*

*Question 23: If an eyeball ISP becomes a Tier-1 provider, does this increase the eyeball's market power on the interconnection market because there are no alternative Tier-1 providers to reach the customers of this eyeball ISP?*

Generally, very different views were expressed regarding this question. Those respondents who did not see the risk of eyeballs' market power increasing reasoned that an operator could access an eyeball's customer either indirectly, by buying transit from this ISP's Tier-1 peers, or directly, by direct interconnection (paid peering or transit) with that eyeball. One stakeholder argued that eyeballs have to provide CAUs with access to the whole Internet, making it unlikely that eyeballs refuse interconnection. Two others referred to the bargaining power of (global) CAPs. BEREC should rather consider the risk that global CAPs acquire Tier-1 status and gain market power on interconnection markets.

Other stakeholders expected an increase in market power if eyeballs became ISPs. If eyeballs let their transit congest (e.g. by internally buying transit capacities), this would imply an intentional reduction of route multiplicity to route singularity. In this case market power would be used to push towards paid peering. Allowing transit capacities to congest would make it no longer possible for another provider to increase the eyeball's costs by moving traffic to the transit link as this would hurt its own performance.

One stakeholder, while seeing a potential increase in market power, had less concern about mobile networks because there are different ways for users to access the Internet (e.g. mobile networks and Wi-Fi).

*BEREC holds that if eyeball ISPs gain Tier-1 status this may increase their market power. However, this depends, inter alia, on whether it is possible in practice to buy transit services from another Tier-1 ISP that peers with the Tier-1 eyeball ISPs, for example.*

*BEREC recalls that, in those few instances where disruptions in IP interconnection occurred as a result of disputes between ISPs, these were solved within a relatively short period without regulatory intervention – and also because of the competitive pressure of end users at the retail level.*

#### 2.3.4. Chapter 5: What is the regulatory context for IP interconnection?

*Question 24: Will Art. 5 become more relevant as some large eyeballs have equally qualified as Tier-1 providers not having to rely on transit any more?*

Several respondents did not see a case for Art. 5 AD to become more relevant, many referring to the arguments put forward in reply to Question 23. Thus, they either stressed indirect interconnection alternatives or reasoned that CAUs' ability to switch would put pressure on eyeballs, thereby enforcing commercial solutions. Another respondent, while seeing a risk that eyeballs' market power could increase (Question 23), considered Art. 5 relevant only when CAUs do not have a choice, or when switching costs are high.

However, three of these stakeholders stated that BEREC should consider assessing interoperability, as this was not assured by OTT providers. Another respondent reasoned



that the scope of Art. 5 is not sufficient to cover all the potential sources of market power concerning IP interconnection. Furthermore, although CAPs might have market power, this stakeholder did not necessarily see this as a call for market power.

One respondent saw a clear case for Art. 5 becoming more relevant as a means to overcome eyeballs' monopoly power and their incentive to prefer their own services over alternative ones. Furthermore, this respondent called for the right to colocation.

Another comment pointed out that imposing obligations based on Art. 5 required access to end users. If a Tier-1 provider refused to peer 'with a fake one', the NRAs should use Art. 5 to ensure that eyeball ISPs restore global connectivity by buying transit from another transit provider.

One of the comments explicitly agreed that Art. 5 did not allow the enforcement of mandatory any-to-any peering and did not provide a legal basis to set a specific price for interconnection.

*BEREC points out that a possible application of Art. 5 AD requires a careful legal assessment as to whether the requirements set out in the Article are met in a specific case. Thus, BEREC upholds its explanations set out in Ch. 5.2 and stresses – given the rather economic focus of the report – that the aim was not to conduct a comprehensive legal analysis.*

*BEREC points out that an assessment of interoperability of services is beyond the scope of the report. In particular, obligations imposed based on Art. 5 presuppose undertakings that control access to end users. This is not the case for OTT providers.*