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Body of European Regulators for Electronic Communications

BEREC

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Differentiation practices and related competition issues in the scope of Net Neutrality

Draft report for public consultation

29 May 2012

Executive Summary

(1) In the last decade end-users, the economy and our societies have greatly benefitted from the growth in both Internet connectivity and content and applications available to them. This growth has, so far, largely relied on the so called *best effort* Internet.

(2) In the last few years, some ISPs have begun to move away from pure *best efforts* and started to introduce some degree of prioritization – i.e. by introducing specialized services or managing traffic of capacity hungry applications such as peer-to-peer (P2P). In some cases, other practices have arisen such as blocking or shaping traffic from certain applications e.g. VoIP. All of these developments are spurring a debate about their implications for the future development of the Internet.

(3) The Net Neutrality debate that has emerged over the course of the last decade at the initiative of Content and Application Providers (CAPs) and end-users is about whether these developments may be against their interest. More precisely, under what circumstances could these developments raise end-users' concerns.

(4) Among others, the following concerns have been suggested:

- the development of premium-priced priority Internet access offers, which would allow operators not only (a) better meet demand from end-users and CAPs but also (b) extract value from bandwidth scarcity, could reduce incentives to invest in new capacities (reducing *best efforts* Internet to a so called "dirt road");
- the development of applications or protocols that block or reduce the possibilities of development of new services on the Internet, and that may lead to the situation that purchasing a "plain Internet" access offer could in the end prove to be too expensive for the average citizen;
- the hindering of services by ISPs vertically integrated with CAPs, with the risk of increased development of "walled gardens", reducing the possibilities for "one man in a garage" to create new successful services;
- the development of bilateral agreements between ISPs and CAPs for the prioritization of the CAP's content on the ISP's network, with the risk of evolving toward a two-speed Internet, where only big and already existing CAPs can reach the end-user with a good quality of service, hence limiting the opportunities for new entrant CAPs and the "man in the garage".

(5) In BEREC's Response to the European Commission's consultation on the open Internet and Net Neutrality in Europe[1], Net Neutrality was described as follows:

> "A literal interpretation of network neutrality, for working purposes, is the principle that all electronic communication passing through a network is treated equally. That all communication is treated equally means that it is treated independent of (i) content, (ii) application, (iii) service, (iv) device, (v) sender address, and (vi) receiver address. Sender and receiver address implies that the treatment is independent of end user and content/application/service provider.
>
> There have been and will continue to be deviations from this strict interpretation. Some of these deviations may well be justified and in the interests of end-users

[1] BoR (10) 42 of 30 September 2010.

but other forms could cause concern for competition and society. To assess this, NRAs will need to consider a wider set of principles and regulatory objectives".

(6) This description of Net Neutrality is very close to the situation in a world of widespread pure *best efforts*, even if *best efforts* and net neutrality are not exact synonyms. We continue to use this definition as useful working benchmark for the purposes of this report.

- **Context: Legal environment and BEREC policy background**

(7) The European regulatory framework assigns a responsibility to NRAs, in ensuring the efficient operation of electronic communication networks in general, and the Internet in particular, taking into account of the principle of net neutrality as well as the various restrictions weighing on market players. To meet this responsibility, BEREC has set itself the task to identify and promote rules and best practices that apply regardless of networks technology, in a manner that is fair to all of the different stakeholders, and acknowledging that this topic has a dual dimension: technical-economic and social responsibility. In this regards, the following consideration (*in* recital (5) of the Framework Directive) should be borne in mind: "*The separation between the regulation of transmission and the regulation of content does not prejudice the taking into account of the links between them, in particular in order to guarantee media pluralism, cultural diversity and consumer protection*".

(8) More specific demands are contained in the new telecom package that was adopted in December 2009, where more emphasis is given to symmetrical regulation, providing NRAs with more wide-reaching objectives and tools than before for achieving a threefold goal (as reflected in Article 8 of the Framework Directive):

- To achieve the overarching objective of guaranteeing access to content for the interest of the citizens of the European Union: "*promoting the ability of end-users to access and distribute information or run applications and services of their choice*" (Art. 8 § 4.g);
- To ensure that electronic communications networks run smoothly, in other words to guarantee a satisfactory quality of service; this is covered by traditional objectives falling on NRAs, notably: "*ensuring that the integrity and security of public communication networks are maintained*" (Art. 8 § 4.f) and "*encouraging (…) and the interoperability of pan-European services, and end-to-end connectivity*" (Art. 8 § 3.b). The new power to set a minimum quality of service (see hereunder) may also be viewed in this light ;
- To enable the long-term development of the networks and services through innovation and the development of the most efficient technical and business models; competition plays a fundamental role here, hence the importance of NRAs' objective of "*ensuring that there is no distortion or restriction of competition in the electronic communications sector, including the transmission of content*" (Art. 8 § 2.b)

(9) In its response to the 2010 public consultation of the Commission[2], BEREC had already started analyzing the reach and implementation possibilities of relevant tools in the framework to address net neutrality issues (including inter alia Article 5

[2] BEREC "*Response to the European's Commission consultation on the open internet and net neutrality in Europe*" was adopted on 30 September 2010.

of the Access Directive, or disputes settlement in Article 20 of the Framework Directive). Two areas were most recently investigated by BEREC:

- The obligations to be transparent with end-users about any possible restrictions on usage, or traffic management techniques, implemented by network operators (Art. 20 & 21 of the amended Universal Service Directive, USD). See BEREC "Guidelines on Transparency in the scope of Net Neutrality" published in December 2011.
- A new power to set a minimum quality of service, overseen by the Commission, "*in order to prevent the degradation of service and the hindering or slowing down of traffic over networks*", due in particular to certain traffic management practices, in accordance with Article 22 of the amended Universal Service Directive. This was the subject of a first "Framework Report" adopted by BEREC in 2011, which should be followed by Guidelines in 2012. One aspect the latter will consider in particular is to what extent the provision suggests that quality of service does not pertain only to the end users' point of view, but also includes the terms extended to CAPs for routing their traffic. Recital (34) associated with this clause (*in* the Citizen's Rights Directive amending USD) notably stipulates that "*those procedures should be subject to scrutiny by the national regulatory authorities, acting in accordance with the Framework Directive and the Specific Directives, and in particular by addressing discriminatory behaviour*".

(10) This last reference illustrates one of the many links between the different aspects of the net neutrality work streams, and in particular the concern about "discrimination" that is considered in this report. Bearing in mind those links, this report will further develop BEREC analysis with respect to the various objectives set out below, in particular by assessing the static and dynamic impact of potential differentiation practices by ISPs.

Approach of the report

(11) This report examines and assesses the potential impact on end-users of departures from Net Neutrality at the initiative of ISPs. We define a differentiation practice as any decision of ISPs or any agreements between ISPs and CAPs or ISPs and end-users entailing that some traffic from or to some CAPs or end-users, or related to specific application or protocol, is treated differently – i.e. slowed, accelerated or blocked – than those of other CAPs or end-users or other applications or protocols. These differentiation practices could include situations in which CAPs are charged. This report examines which differentiation practices may or may not in principle harm the end-user's interest and have a negative impact on competition and innovation, both in electronic communications markets ("networks") and in content[3], application and services markets ("content"). In doing so, it aims to provide a conceptual framework for assessing potential end-user harm concerns and identifies the main elements of such assessment.

[3] The need for NRAs to consider impact on innovation at both ISP and CAP level is also underlined in the regulatory framework: see for instance Recital (8) of the Better Regulation Directive (amending the Framework Directive and the Specific Directives): "*In order to achieve the goals of the Lisbon Agenda, it is necessary to give appropriate incentives for investment in new high-speed networks that will support innovation in content-rich internet services and strengthen the international competitiveness of the European Union*".

(12) The potential effects on end-users include both static and short term impacts and the longer term dynamic implications. The former capture the impacts on end-users in terms of prices and quality of their current Internet connection and of the content and applications services that are available today. Dynamic impacts consider the incentives to invest and innovate in the different parts of the value chain. In particular, it considers the impact of differentiation practices on the incentives to invest and innovate of the various parties. This will ultimately have an impact on end-users. In this respect, the specific characteristics of the Internet should carefully be taken into account, in particular the open platform aspect (e.g. "universal connectivity", "very low entry cost", "usage agnostic" or "separation of network and applications layers", "innovation without permission") and network externalities.

(13) Upholding the principle of neutrality concerns all of the players involved in the "Internet chain", whether the parties operating electronic communications networks routing internet traffic, or the many and various providers of services in the information society. As such, some of the questions raised in the debate around internet neutrality fall outside the realm of the rules and regulations that apply only to electronic communication networks. These networks nevertheless occupy a central place on the "internet chain" and among the players that populate it. Indeed, the entities that operate these networks have a special responsibility because of their essential function of routing traffic between users. ISPs are therefore the first ones affected by the demand for neutrality.

(14) In this report we focus on differentiation practices that are instigated by ISPs. This is to say that we do not examine differentiation practices that are imposed on ISPs by legal requirements, whose relevance and legitimacy are out of the scope of this report. Nevertheless, this does not preclude us from considering the way in which such requirements are implemented, since the specific technique chosen by an operator may not be appropriate with regards to the fulfilment of the abovementioned objectives.

(15) BEREC acknowledges that, beyond the considerations highlighted above (competition, innovation and harm to end-users interest), there are other aspects, which are a part of this debate – e.g. issues related to freedom of speech or access to certain type of content which may be deemed socially useful. For instance, BEREC mentioned in its response to the public consultation of the Commission that "*There have also been some concerns expressed relating to the effective exercise of fundamental rights and freedoms such as freedom of expression or privacy, that could arise if operators were to give preferential treatment to some kinds of data flows (…)*". These considerations are not the focus of report, and should be examined in the light of relevant legislations.

- **Framework to analyze differentiation practices**

(16) In this document BEREC proposes a conceptual framework to analyse differentiation practices, applying it to concrete examples. This analysis is based on the potential effects of the practices on end-users, either directly (through the impossibility to use some services) or indirectly (through, for example, a reduction in alternative choices).

(17) The proposed analysis includes:

- A description of ISPs' incentives to discriminate (basically based on revenue maximization through their vertical integration or cost minimization absent any vertical integration);

- The ISPs' ability to perform the discriminatory practices in a sustainable manner despite possible end-users reaction, which depends among others on their position in the market;
- Finally, acknowledging the particular features of the Internet "ecosystem", the dynamic and static effects of these practices are taken into account. As stated above, due to network effects of Internet, any restriction could create entry barriers either for end-users or, in particular, to CAPs, reducing this virtuous circle and affecting future consumer welfare.

(18) The above framework has been applied to example cases to test it and try to obtain more general lessons that could be applied in other situations that could arise in the future. Therefore, the purpose of these examples is not to provide definitive answers – these can only be reached in specific cases and examining the evidence available – but to try to identify what are likely to be the key elements of any competition analysis.

(19) According to the data gathered by BEREC, most of ISPs offer Internet access with no application-specific restrictions. But specific practices (like blocking or throttling of peer to peer traffic or VoIP) more often occur in mobile network than in fixed network sector.

(20) Accordingly, the practices considered are:

- VoIP blocking on mobile;
- P2P blocking on fixed broadband;
- Differentiation in the conveyance of traffic of CAPs (quality and/or price).

▪ Main findings

(21) Vertical integration gives incentives to implement differentiation practices to ISPs as they could reduce competitive pressure on their own retail services. The paradigmatic example of this is VoIP, where ISPs are providing voice calls through the traditional fixed or mobile network, while end-users could find substitutes on Internet (maybe no perfect substitutes but at least viable substitutes for some types of calls) at lower prices (even for free). Indeed, this practice is one of the most widespread according to the data gathered by BEREC.

(22) As this differentiation has the aim of foreclosing, the effects on end-users are high because these practices have both static and dynamic effects. The lesser the competition, the higher the prices and in addition, restrictions on CAPs could have effects in the long run by limiting their growth by reducing their potential demand.

(23) In those cases where the ISP providing end-users with connectivity (end-user connectivity provider [ECP]) is not vertically integrated, potential differentiation practices could affect content and applications not provided by the operator. In these cases, the rationality behind such practice is either cost reduction (understood in broad terms such as network costs, but also congestion management), or income increase. Traffic management would have the aim to move from the current *"no commercial relation practice"* between CAPs and ECPs to a scenario where the ECP starts charging CAPs, in order to increase the total income of their operations.

(24) BEREC has acknowledged that ECPs should have the opportunity to manage their networks to increase efficiency, minimising the resources needed to provide the service and assuring the best deal to all end-users. It is important to note that congestion has some hidden costs that are difficult to measure, as it affects all end-users connected to the network. In this sense, a fair traffic management could be welfare enhancing.

(25) These arguments are only valid if the restrictions are done in a non-discriminatory basis among all content and applications providers, and under objective criteria such as consumption of resources. In other cases, the rationality behind the ECPs' behaviour could be distortion of competition.

(26) It is important to bear in mind that it could be also the case that ECPs opt to restrict or block in broad terms the content accessible by end-users from their connections. In this case, the above conclusions might not be valid because the final outcome of taking together all restrictions is harm to end-users by reducing the available choice from their connections. This could be especially problematic in an environment where ECPs tend to block or degrade applications or CAPs in a general basis, including when e.g. a particular ECP blocks a specific application or CAP, another ECP blocks a different application or CAP, and so on. In this context, Internet current features would be very difficult to maintain, affecting end users' welfare.

(27) The report has nevertheless identified some key elements that could potentially deter ECPs from implementing differentiation practices that harms end users:

- Competition observed at retail level. NRAs have tools under the current framework to enhance competition and prevent the strengthening of SMP positions. Any measure aimed to forbid an anticompetitive practice would be a second best compared with a scenario where market develops in an effectively competitive manner.
- Consumer awareness, market transparency and low switching costs. The sustainability of restrictive practices would depend on consumer awareness of differentiation practices and their possibilities to exert pressure on the ECPs by their purchasing decisions. The easier a consumer could detect a restrictive practice and change its ECP, the stronger the pressure on ECPs to reduce unfair and discriminatory practices.

(28) Finally, when retail competition is not enough to grant an adequate output for end-users (which does not need to be exactly the same as the one observed today), NRAs have different ways to deal with specific behaviours of the ECPs.

(29) In the presence of a SMP operator, regulation under the common regulatory framework of electronic communications networks and services and competition law has tools to address some potential problems. In addition, the revision of the existing Directives has granted additional tools to NRAs e.g. in the form of minimum quality requirements, which could – on the basis of the decision taken by the NRA considering the particular circumstances of the case – be also applied to operators having SMP in a given market. Application of the QoS provisions may be particularly relevant taking into account that the practices undertaken by the SMP operator/s could be those that have been deemed particularly detrimental for the development of competition, in particular in instances of foreclosure.

(30) Furthermore resorting to QoS provisions might also be effective in a situation where discriminatory practices that do not have any legitimate objective and fair rationality become more frequent, even absent SMP[4]. In this case, end-users' connections may be degraded by such practices and future innovation might be discouraged. Imposing minimum quality requirements should only come after a thorough analysis

[4] The mediation by NRAs in conflicts arising between electronic communications operators and CAPs may also be an option, on a case by case basis, when on the basis of national law NRAs have been granted the possibility to intervene to solve such cases via dispute settlement procedures.

of the practices and their situation in the context of a market, which are detailed in BEREC's Guidelines for Quality of Service in the scope of Net Neutrality.

1 Introduction

(31) In the last decade end-users, the economy and our societies have greatly benefitted from the growth in both Internet connectivity, content and applications available to them. This growth has, so far, largely relied on the so called *best effort* Internet.

(32) In the last few years, some ISPs have begun to move away from pure *best efforts* and started to introduce some degree of prioritization – i.e. by introducing specialized services or managing traffic of capacity hungry applications such as peer-to-peer (P2P). In some cases, other practices have arisen such as blocking or shaping traffic from certain applications e.g. VoIP. All of these developments are spurring a debate about their implications for the future development of the Internet.

(33) Further complexity is brought into this debate through considerations on long-term innovation and fundamental freedom and their link with unrestricted access to "the Internet". Leveraging on the fundamental role of competition, the revised framework puts forward the tools to make this competition effective, addressing market failures and empowering the customer (representing the demand side of this "two sided market"). It also explicitly emphasizes the need for NRAs to promote "the ability of end users to access and distribute information or run applications and services of their choice".

(34) In responding the Commission 2010 consultation, stakeholders referred to identification and economic assessment of traffic management rules as the major issue regarding net neutrality. Prioritisation implicitly has the consequence of discrimination, but a number of aspects should be taken into account to evaluate possible negative consequences for the level of competition, innovation and the interests of end users. In 2011, BEREC initiated an economic analysis of the potential and theoretical effects of discriminatory behaviour.

(35) The result of this analysis is this report that is organised as follows:

(36) First, we set the wider context by discussing how the Internet is currently organised, including recent and likely future trends. We also examine the value chain that applies to the Internet ecosystem (section 2).

(37) Second, we describe the possible reasons that may lead ISPs to introduce differentiated practices. We have classified them as ranging from legitimate motivations – i.e. to fulfil legal requirements or to ensure network security and integrity – to motivations that may be more difficult to classify as to their effects - i.e. providing differentiated services to end-users or CAPs or protecting existing services. Then, we describe the kind of direct and indirect effects that may be produced by these practices (section 3).

(38) Third, we provide an analytical framework for assessing the possible impact on end-users of various differentiation practices (section 4).

(39) Fourth, we consider some illustrative differentiation practices to which we apply the above analytical framework. We have identified a number of practices and we assess their impact (section 5).

(40) Lastly, we try to draw some conclusions and identify the key themes that have arisen from the discussion of the analytical framework. We also raise some issues relating to the remedies available to NRAs (section 6).

2 The Internet Value Chain

2.1 Context and recent evolutions

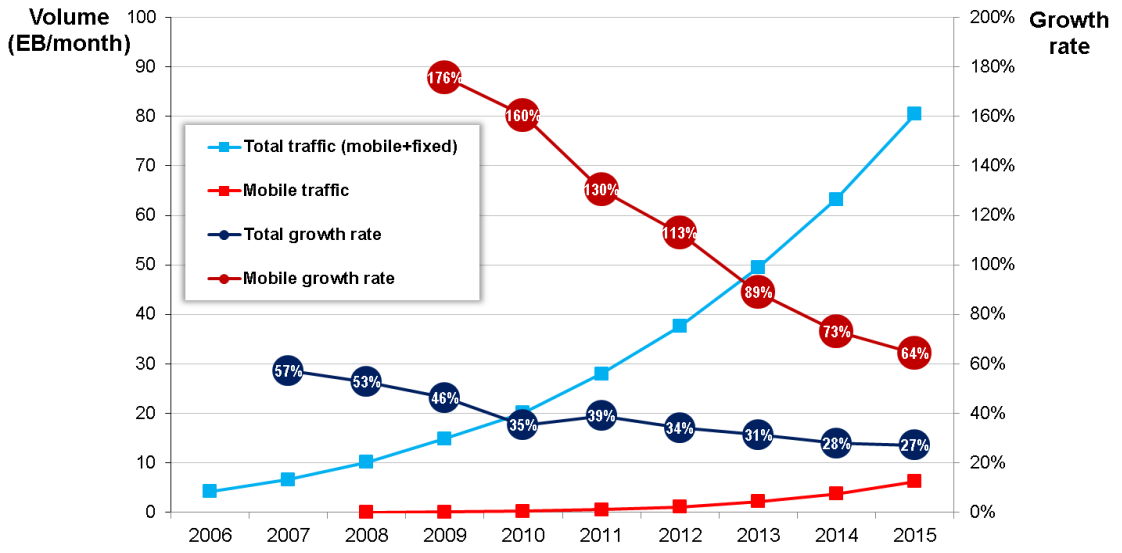
(41) The Internet connectivity market has grown from zero to a multi-billion-euro business in fifteen years. The majority of the European population use the Internet with some kind of broadband connection, and the industry has invested billions of euros in up-dating the old network and rolling out the new fibre technology in order to provide better services at a lower price to more customers: that is, the industry has produced investments in infrastructure and ensured an ever increasing bandwidth capacity. In the same period, the industry showed a high level of innovation in content, too. Barriers-to-entry in the market have been very low due to the open nature of the Internet. Any content provider – bloggers, website owners, SME and large corporate – for a relatively low level of investment to buy a domain name, rent space on a server and implement its application or software - has had the opportunity to test its ideas and their relative value in the marketplace. As a result, new services have been made available to end-users: browsing, mailing, P2P, instant messaging, VoIP, videoconference, gaming online, video streaming, etc. This development has taken place mainly on a commercial basis without any regulatory intervention.

(42) Mirroring the market evolution, the traffic conveyed on networks has been increasing continuously. In 2010, worldwide IP traffic, according to Cisco's estimation, stood at 20.2 exabytes per month and outstanding growth rates are expected in the coming years. Overall IP traffic is estimated to quadruple by 2015, to reach 80.5 exabytes per month. Cisco forecasts a slowing down of the annual rate of growth of IP traffic to 27 % in 2015. For Europe, the annual growth rate of international bandwidth usage levelled off to approximately 50 % in 2010.

(43) For mobile data traffic the rate of growth is higher than for fixed data traffic. However, this is particularly due to the fact that the increase in mobile traffic starts from a significantly lower level. In 2011 mobile had a share of approximately 2 % of total IP traffic. While the growth rate for global mobile data traffic was about 130 % in 2011 it is expected to decline to 64 % in 2015.[5]

[5] WIK-Consult (2011, p. 31/32) based on Cisco and WIK calculations.

Figure 1 – Global IP traffic developments



Source: Cisco, 2011 (Visual Networking Index)

(44) In parallel with market developments, rapid and incessant technology innovations that characterize the sector have enhanced the transformation of the Internet "ecosystem" and the interaction between the various economic entities operating there.

(45) The basic feature of the Internet "ecosystem", from its outset, has been the best effort paradigm. The term best effort delivery describes an electronic communication service in which the network does not provide any guarantees that data is delivered or that a user is given a guaranteed end-to-end quality of service level or a certain priority class. In a best effort network all users obtain best effort service, meaning that they obtain unspecified variable bit rate and delivery time, depending on the current traffic load. By default, unless instructed otherwise, best efforts delivery networks treat all end-user service requests (demand for network capacity) equally, irrespective of their nature or content.

(46) Nowadays, traffic management techniques allow ISPs to manage traffic more extensively and precisely and to differentiate the packet routing, depending on the techniques used, based on content, applications, transport/access services and users. In general, traffic management allows for a wide range of operations, each highly heterogeneous, such as, inter alia, the construction of fast lanes (i.e. traffic classes) for certain types of data (so called prioritisation); the provision of guaranteed network capacity to specific users; prevention of access to illegal content; authentication of customers; blocking of viruses, or the ability to block or degrade certain content. Taken together, traffic management offers potential benefits to stakeholders and may contribute to enhanced social welfare (e.g. by managing/reducing congestion); on the other hand, traffic management may be used to implement strategic practices, using restrictive techniques –to the benefit of the operator but, in some cases, to the detriment of end-users (or at least a part of them).

(47) Furthermore, Internet applications are becoming more and more diverse and start to demand specific requirements depending on their features (for example, real

time applications,). In general, relevant parameters in the Internet experience are, inter alia, the bitrate or throughput (the amount of data transmitted in a unit of time), delay, jitter (time variation of the average delay), and packet loss ratio. According to the type of application, some of these parameters assume particular relevance and become biting constraints in the service provision. For example, P2P quality depends mainly on the effective bitrate available whereas delays in packet transmission may be tolerated with minor effects on the P2P quality; therefore it is classified as a capacity-hungry application. Vice-versa, the quality of a VoIP call, being a real-time communication application, relies on the minimisation of mouth-to-ear delay. As far as applications relying on Internet capacity require different transmission characteristics and the quality perception of end-users depends on the application performance, operators could need to implement traffic management tools to allow these new applications to appear and grow (discussed later in this report). It is also a fact that VoIP applications offer good speech quality based on ordinary best effort transmission despite of the claim that specific traffic management may be needed for real-time applications.

2.2 Value chain

2.2.1 Retail players in the value chain

(48) The abovementioned market developments and technological innovations have been shaping and modifying the commercial relationships between the different actors in the Internet value chain.

(49) In the value chain described along the document three major economic entities are active (Figure 3):

- Internet Service Providers (ISPs) or Electronic Communication Providers (ECP), namely network operators (including fixed and mobile network operators – FNOs, MNOs) and virtual operators (including resellers and Mobile Virtual Network Operators - MVNO), which provide Internet access services to end-users, as well as other intermediary operators or business connectivity providers. ISPs/ECPs are paid for their traffic services by CAPs or end-users;
- Content and applications providers (CAPs). CAPs offer a wide array of activities such as content aggregation and search engines, messaging applications, entertainment, transactions, and include different players such as over-the-top, media companies, right-holders, end-users that generate content, and even ISP. CAPs are paid for their services by their users and/or by advertisers;
- End-users[6] who purchase access to the Internet by ECPs and use (free or paid) content and applications provided by CAPs. The end-user can be

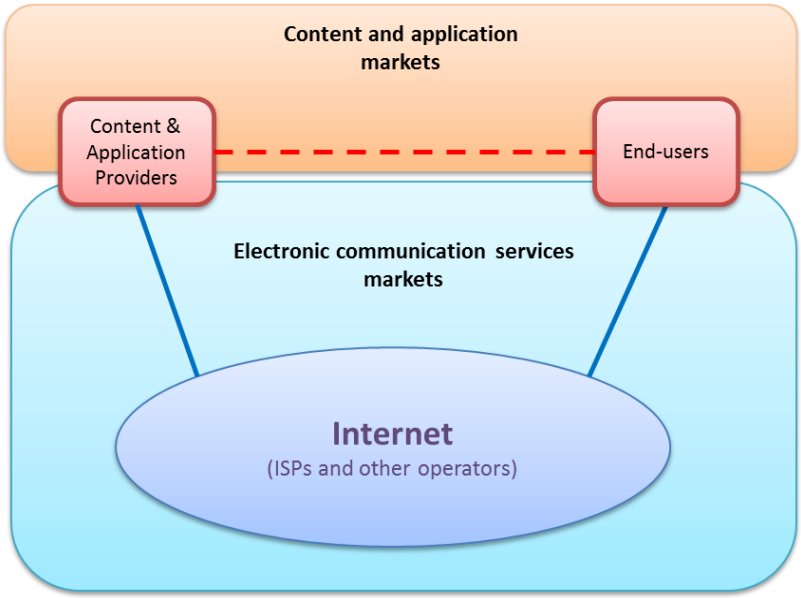
[6] The definition taken in this document could be, in some cases, more restrictive than the definition included in the Framework Directive where an *"end-user means a user not providing public communications networks or publicly available electronic communications services"*. According to this definition, CAPs could be considered as end-users. However, in this report, for the aim of clarity, we have restricted this concept to any legal entity or natural person

either a consumer or a business user. End-users derive utility from the consumption of two complementary goods: connectivity paid for and provided by the ECP, and contents provided by CAPs[7] that maybe free of charge or paid for.

(50) Manufacturers of devices, software and hardware solutions also play an important and ever increasing role in the broadband market because, among other things, they are interested in developing new solutions and new equipment to facilitate the dissemination of data services. However, the impact of the ICT sector is outside the scope of this report as it is focused on the issues related to the net neutrality debate that may arise from the behaviour of electronic communications services providers.

(51) The interaction of these economic entities leads to the delivery of services to end-users who i) purchase access to the Internet by ISPs, and ii) use (free or paid) content and applications provided by CAPs via handsets, devices and goods produced by ICT manufacturers.

Figure 2 – Simplified value chain



(52) In the value chain for the Internet as a whole, ISPs have a particular role as a hub. On the one hand, ISPs provide access to electronic communication services to end-users and, on the other hand, they enable interaction between CAPs and end-users. ISPs thus play the role of enablers or platform intermediaries, making viable the transactions between end-users and CAPs.

(53) It must be emphasized that CAPs interact with end users on so-called content and application markets, but typically these interactions do not involve necessarily a direct connection and do not involve electronic communication services markets.

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using or requesting a publicly available electronic communications service at retail broadband markets not including CAPs.

[7] In the BEREC report "An assessment of IP-interconnection in the context of net neutrality" the end-user at retail broadband markets is defined as content and applications user (CAU), given the term end-user as defined in Art. 2(n) FD is more comprehensive (as stated above).

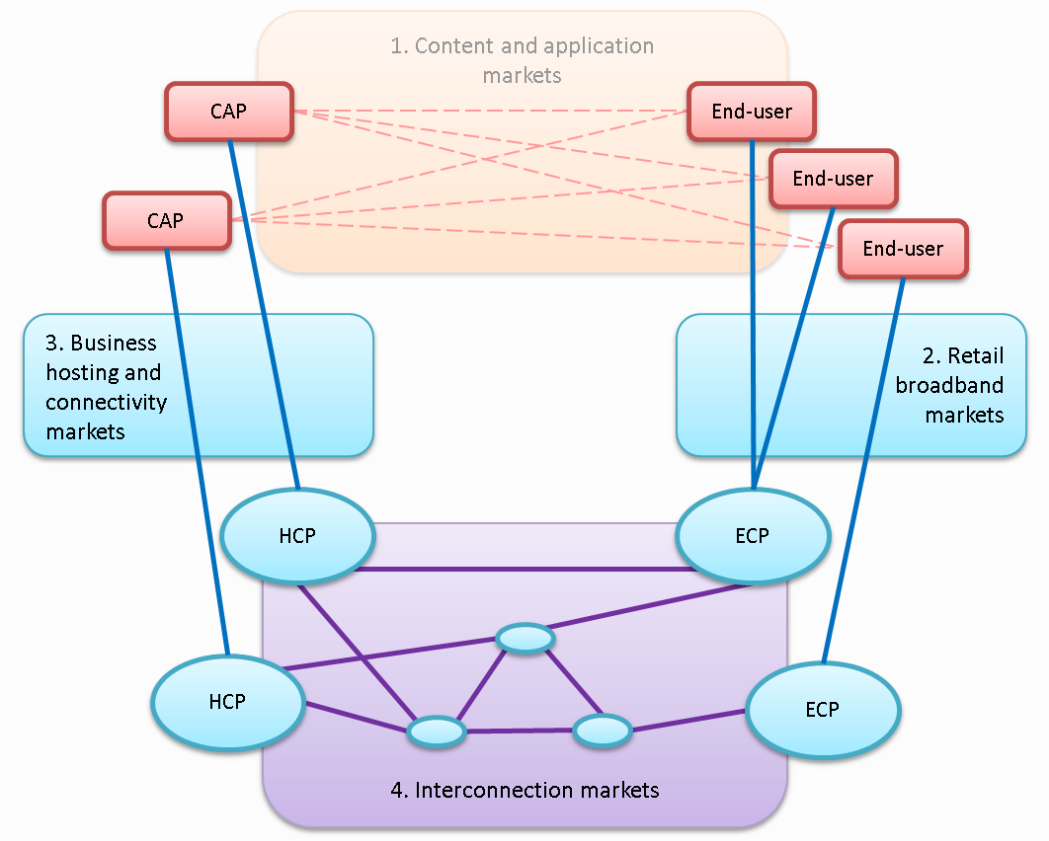
The physical link between CAPs and end users goes through the electronic communication services (ECS) markets with ISPs acting as an intermediary.

(54) The ECS markets around Internet are a complex system where various kinds of players can be distinguished. A more detailed view of these interactions and the underlying contractual relationships is provided below.

2.2.2 Upstream level

(55) For the sake of clarity in the remainder of the document, it seems useful to introduce a more detailed description of the electronic communication services inside the Internet value chain. The figure below identifies players and markets in a schematic way. In this figure, players refer to specific functional roles: even if one person or undertaking generally has one specific role in the value chain and is thus represented at a particular layer in the figure below, it can be the case that they are also active at other parts of the Internet value chain.

Figure 53 –Categories of electronic communication services in the value chain



(56) ISPs are actually involved in a number of different product markets, which all come under the umbrella of “ECS markets” shown in the previous diagram. Each ISP is active in one or several markets, for which we propose the following descriptions:

- ECPs (end-user connectivity providers) are ISPs for end-users, on “retail broadband and internet access markets”;

- HCPs (hosting and connectivity providers) are specialized ISPs providing services to CAPs in “business hosting and connectivity markets”. In some cases ECPs and HCPs could be the same ISPs;
- ISPs interact with each other on “wholesale interconnection markets”.

(57) Within the ECP category, access network operators (FNOs and MNOs) have traditionally borne the entire high cost of local access infrastructure deployment to provide broadband connectivity services and have passed this on to end-users through access and usage charges. Similarly, once the access network has been installed, the ECPs upgrade capacity transmission to cope with new customer connections and new traffic requirements arising from new services and applications, and they pass this cost to their customers.

(58) In turn, CAPs offer content and applications over the top of the Internet connectivity bought by end-users from ECPs. Content may be provided either for profit (on a commercial basis) or “not-for-profit” basis. Likewise, content may have a different impact on networks (depending on the technical requirements needed for each type of application) and may belong to different product sectors/markets. In some cases those content/applications can include markets traditionally occupied by network operators (such as voice services).

(59) At present, ECPs are mainly charging end-users for their broadband Internet access, and generally do not charge CAPs which need ECPs to access the end users. This situation has been denominated, by the economic literature, as the “zero price rule”. However we consider that this expression could be misleading as it gives the impression that CAPs are not paying for the connectivity services. In the current situation, more often (with some exceptions for some particularly large CAPs developing their own networks) ECPs have no direct contact - and therefore no direct economic relationship - with the CAPs that benefit from those ECPs’ networks which enable them to make their services available to end-users. But this doesn’t mean that CAPs are not paying for connectivity services as they indeed do through HCP. For this reason, the current situation could be termed a “*no-commercial relation practice*”.

(60) ISPs (ECPs and HCPs) have to interconnect their networks with other ISPs. Several forms of interconnection exist, which can be broadly categorized into peering (where two networks agree to exchange their traffic, most often for free when they have a balanced interest but sometimes at a non-zero price) and transit (where one network contracts a transit provider to send traffic across the Internet)[8]. In most cases, ISPs (and particularly the smallest ones) pay for the provision of upstream transit that connects them to the rest of the Internet.

(61) While end-users pay an ECP (on the retail broadband market) in order to access the Internet, CAPs will also buy services from an HCP on their side of the Internet in order to make their content available. That is, users at the “edges” of the Internet each pay for their own connections.

[8] BEREC is working on a report “An assessment of IP-interconnection in the context of net neutrality” covering qualitative information on the different types of the commercial IP interconnection agreements. This work will continue and it is expected the publication of a BEREC Report on IP interconnection during 2012. The analysis of competition and the technological developments of the IP interconnection market may complement the discussion and analysis performed in the present document.

(62) In summary, payments mainly take place at the "edges" of the Internet, which means, generalising, that CAPs just pay their own HCPs to make their content available, but do not have to pay to the ECPs that have the connection with the end-user in order to reach their end-users. While vice versa end-users don't have to pay the HCP that hosts the content they wish to access. This feature has been considered one of the key elements that allowed the fast development of the Internet.

(63) At the same time payment mechanisms associated with interconnection markets allow for the financing of the inner networks and operators of the internet, i.e. those who are not directly at the contact of end-users (or at the "edges") and do not receive direct revenues from them: operators may pay each other or organize mutual traffic transport by barter transactions, depending on their interconnection agreements.

2.3 Trends and debates

(64) The traditional management, including the pricing structure, of the Internet "ecosystem" is, according to some players, under pressure for a number of reasons.

(65) Firstly, they argue that the demand for data transmission over the Internet is constantly growing due to the development and the uptake of new applications based on P2P communication, video streaming etc. and ISPs have to cope with this growing demand. In other words, without incremental investments (whose size is nevertheless debated as it also depends on technical progress which has been pretty steady over the last years), network capacity may become a scarce good.

(66) Secondly, it is argued that some CAPs are increasingly using the Internet to deliver new applications to end-users and could be demanding a level of quality that may go beyond the traditional "best effort" quality of Internet access. A demand for quality-differentiated services that has always been present and can be met either by a growing supply or by new traffic management practices.

(67) Thirdly, traditional telecommunications providers, cable operators and mobile operators selling broadband services over their networks are increasingly facing competition from Internet players delivering new applications that compete more or less directly with their traditional services. Examples are VoIP, Video on demand, etc.

(68) Some players argue that the increase of the capacity in the best efforts Internet, in order to maintain a simple, efficient electronic communication network, as it has been practiced over the past years, remains a valid approach to these developments. That is, demand for capacity can be accommodated thanks to continuous and steady technical progress in electronic equipment as well as new innovative techniques like content distribution networks (CDNs) and peer-to-peer communication which would be important contributions to enhanced network architecture for high capacity best effort communication.

(69) Others, especially the ISPs that would have to make the corresponding investments, tend to consider that plain and undifferentiated capacity increases (in order to cope with "temporary" spikes in traffic flow) are not a sustainable answer to these developments, and call for new approaches that raise lively debates, among others :

- an evolution of the best efforts interconnection framework, in order to increase the contribution of CAPs to the financing of the costs of conveyance of the traffic of their services;
- a development of traffic management on their network, in order to offer quality-differentiated or service-segmented offers;
- a development of end-to-end quality of service offerings.

(70) These approaches and the questions they raise are discussed in the following paragraphs.

2.3.1 Best effort interconnection

(71) Facing the challenges mentioned previously, there may be alternatives to just increasing the capacity in the best effort Internet in order to maintain a simple, efficient electronic communication network. These new innovative techniques like content distribution networks (CDNs) and peer-to-peer communication can also represent important contributions to enhanced network architecture for high capacity best effort communication.

(72) At the same time, the ever increasing demand for connectivity, higher level of service quality requirements and the greater degree of competition among ISPs and CAPs may be handled not only at the retail level (at the "edges"), but also at the upstream level, through interconnection agreements. It is the case that the IP interconnection sector – which is mainly unregulated – has been experiencing a high level of innovation in pricing schemes, in order to face bandwidth scarcity[9].

(73) In this respect, it is nevertheless worth pointing out that some CAPs are entering the sector with the scope to negotiate over commercial and technical conditions (including better quality services) vis-à-vis ISPs and transit operators (i.e. the backbone companies that are located at the top level architecture of the Internet, interconnected with lines characterized by higher capacity and speeds thus allowing efficient transfer of data over long distances).

(74) Particular attention has been paid, for example, to CDNs – a system of caching servers that distribute content thereby creating a virtual overlay network layered on top of an existing IP packet network infrastructure of the Internet. CDNs may be deployed over-the-top but also by deploying infrastructure components interconnected with each other to provide electronic communication services of their own. From an economic point of view, a CDN could be regarded as a reaction to the failure of the classic hosting and transit markets to provide sufficient and affordable QoS across networks (from the sending CAP to the terminating ISP).

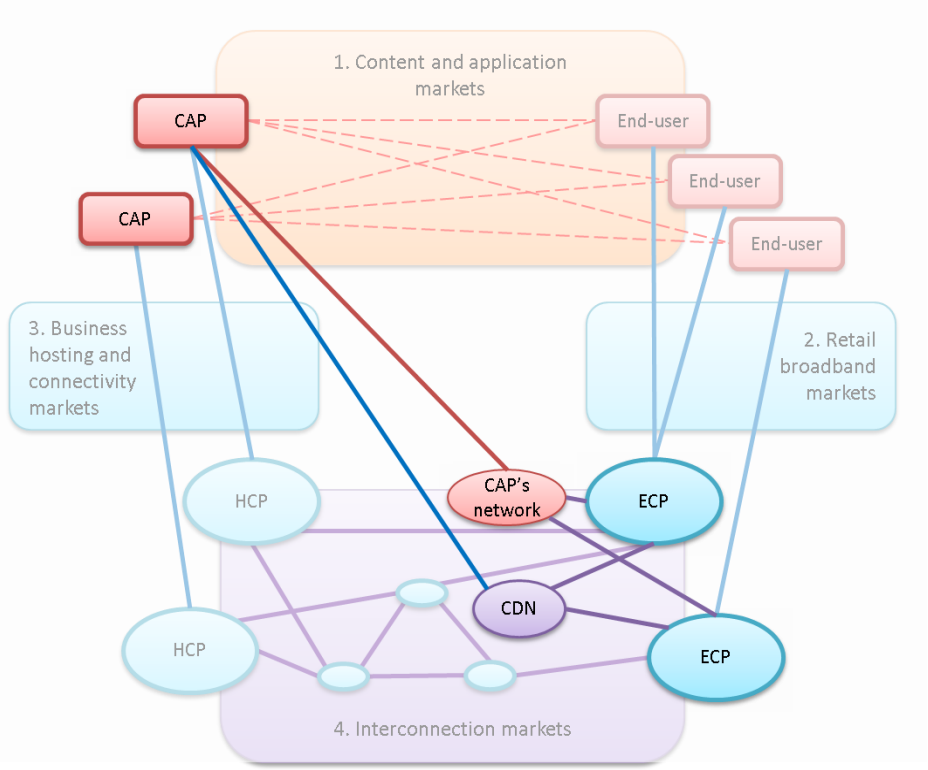
(75) CDNs offer an alternative for CAPs who have the willingness to pay for a better quality instead of relying on contracts with (several) transit networks. In this sense CDNs substitute storage, i.e. local caches, for long-distance networking capacity. CDNs also constitute an alternative for ISPs to using transit services. These multiple relationships are turning CDNs into a "one stop shop", reducing transactions costs and exploiting economies of scale and scope.

(76) These developments on CDNs illustrate the fact that some traffic intensive CAPs or quality sensitive CAPs are actively extending their networks designed to enhance

[9] As mentioned before BEREC will publish a Report "An assessment of IP-interconnection in the context of net neutrality".

the delivery of their content, either on their own (for the biggest of them) or through specialized intermediaries. This is leading, without specific alteration to current billing models, to a slow but significant evolution of the internet interconnection architecture, from a very hierarchical and pyramidal one (the so-called “three-tier” model, with tier one operators on top) to something more reticular (sometimes referred to as a “doughnut”). These developments are illustrated in the following figure.

Figure 4 - evolution of interactions in the interconnection markets



(77) As a consequence, CAPs come into closer and closer contact with ECPs, with fewer intermediaries in between, either only one CDN (CAP only provider, i.e. “pure HCP” ISP), or even in extreme cases CAPs directly, especially if they are infrastructure based network providers by themselves. The development of “pure HCP” ISPs, searching for multihoming with as many ECPs as possible in order to provide CAPs with better QoS and save transit costs, changes the bargaining power between CAPs and ECPs and, accordingly, new charging mechanism may evolve beyond the wholesale (interconnection) level.

(78) BEREC considers these evolutions of interconnection agreements as important inside the internet economy and net neutrality debate, but nevertheless beyond the scope of this report. They are not differentiation practices, as long as they do not affect the way ISPs handle the traffic originating from or terminating to a certain CAP or end user (in case there is no direct relation between the ECP and CAPs and these interconnection agreements are negotiated with intermediaries, such as transit providers, other ISPs or CDNs). Such wholesale relationships are to be

considered outside the issues addressed in this document, and will be analysed further by BEREC in a separate report[10].

(79) The extent to which direct wholesale interconnection with specific conditions between an ECP and a CAP may resort to differentiation practices should be examined later on, when BEREC report on interconnection conditions will be available.

2.3.2 Traffic management

(80) Traffic management makes available technical schemes (e.g. access tiering and prioritisation for quality) that are able to deal with the abovementioned issues. For example, specialized services – that is traffic treated in order to provide guaranteed characteristics (e.g. end-to-end quality or security) connected to higher prices – technically rely on traffic management techniques and access restrictions[11].

(81) In general, as mentioned earlier, traffic management allows for a wide range of operations, each very different. Aside from the construction of fast lanes (i.e. traffic classes) for certain types of data (so called prioritisation) or the provision of guaranteed network capacity to specific users, it may also allow for the prevention of access to illegal content, authentication of customers, blocking of viruses, or the ability to block or degrade certain content, among others.

(82) As they may affect specific kinds of traffic, or the traffic from specific CAPs or end-users, these traffic management practices may impact the relations between CAPs and the ISP which controls access to end-users (ECP).

(83) For the most, these practices will also impact the relationship with the end-user, in addition to the existing relationship between them for the provision of an internet access. As departures from the standard “best efforts” behaviour, these practices amount to the provision to the end-user of a modified or differentiated product.

(84) Things are somewhat different as regards CAPs, which, absent any traffic management practices, do not have a direct relationship with all the ECPs. Traffic management 'practices differentiating the way “their” traffic is handled inside the ECP’s network could give rise to new relations with the ECP even though the way this traffic is handled over the ECP’s network would typically be specified in the interconnection agreement between the ECP and the last technical intermediary that ECP is connected to. This new relation in parallel to interconnection agreements for traffic conveyance may constitute a significant change from the present “no commercial relation practice” mentioned previously. As illustrated in the diagram below, this would especially be the case where the relationship would be designed to collect new revenues from CAPs.

(85) The figure below highlights the relationship that could appear when an ECP implements traffic management which targets the content of a specific CAP (represented by the green doted lines). As the ECP controls the transmission link between this CAP and its own end users (represented by the green arrows), the

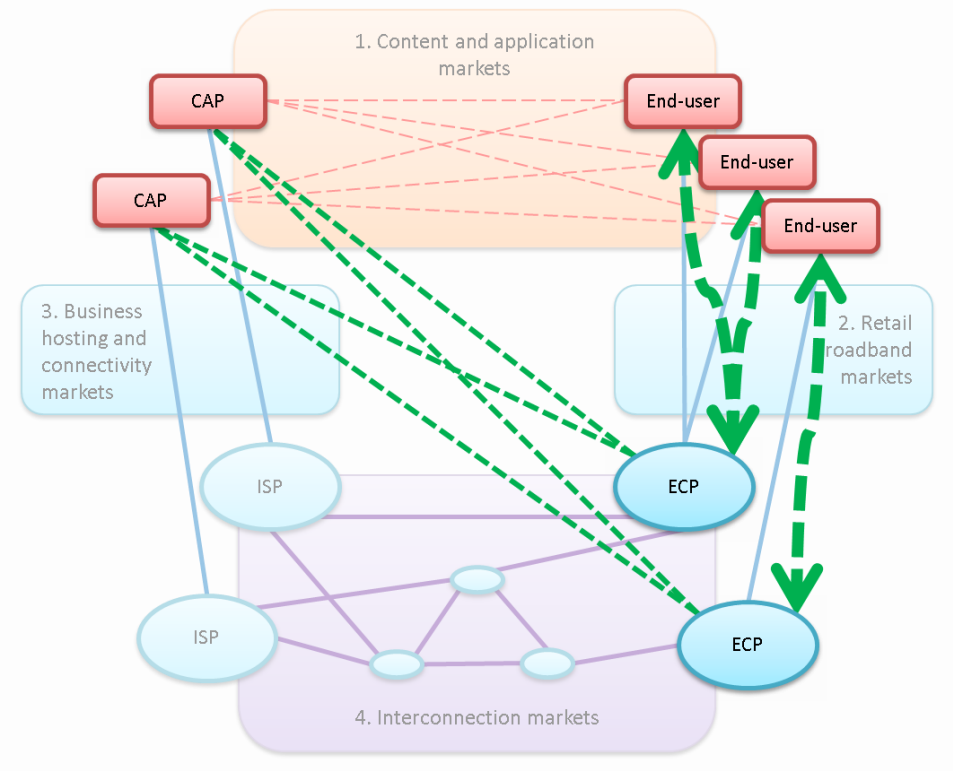
[10] BEREC Report “An assessment of IP-interconnection in the context of net neutrality”.

[11] The application of access restrictions is an important distinction between specialized services and Internet access services. Whereas in the specialized case customers’ service requests may be rejected when the capacity limits of a network are reached, best effort networks, like the Internet of today, still try to serve the customers (implying a decrease in quality for all users).

ECP becomes an unavoidable player for the CAP which wants to enjoy better delivery conditions to these end users.

(86) In general, CAPs are not directly interconnected to the ISPs on the end-users' side (ECPs). Thus, this new relation does not exist yet in the ecosystem as long as there is no CAP-specific traffic management implemented by an ISP. However, it could become more frequent in the future thorough pressure exerted by blocking of specific CAPs, especially if that blocking can be removed with a payment from the CAP, in the sense of skimming the return of capital.

Figure 5 – Interactions induced or impacted by ISP's traffic management practices



2.3.3 QoS interconnection and bandwidth

(87) The two previously mentioned topics (traffic management and interconnection) overlap and may meet in the future, *inter alia,* in relation to the provision of specialized services with end-to-end guaranteed QoS. This would require both a prioritization on the networks of the ISP, as well as some adapted interconnection, that will allow for inter-network QoS. Standardization of quality architectures by IETF that enables guaranteed QoS within individual providers' networks could also be applied to the public Internet in the future, with the most challenging aspect being coordination of QoS aspects at IP interconnections between providers.

(88) This would result in an upstream offering of guaranteed QoS interconnection with downstream guaranteed QoS bandwidth, charged for at the interconnection level, allowing for HCPs or other intermediaries to provide CAPs with end-to-end QoS

they would pay for, without the need for CAPs to engage in direct bilateral relations with every ECP. This has however been discussed for several years now, and no commercial offers along these lines have been launched so far.

(89) Such potential offerings, being differentiated offerings, would fall within the scope of this document. However, these developments are in their infancy and would require substantial technical, economic and contractual standardization that is not yet at hand. Such relationships are to be considered outside the issues addressed in this document, and will be analysed further by BEREC in a separate report[12].

3 Possible differentiation practices

3.1 Introduction

(90) Broadly speaking, product differentiation, in terms of prices, quality etc., on the supply side, is a competitive factor for commercial activities of a firm in order to make goods and services more attractive than competitors'; dynamically, differentiation is a strategy to adapt product commercialisation to a moving environment. On the demand side, differentiation increases variety of choice. Product differentiation is still consistent with effective competition in a specific market, although successful product differentiation creates a competitive advantage for the seller.

(91) Nevertheless, in some specific cases, differential treatment of traffic on the Internet can affect competition, innovation and consumer welfare in general.

(92) It is important to note that it is difficult to conclude a priori that certain forms of differentiated treatment are i) reasonable or not and ii) affect competition and innovation, and iii) harm end-users. That judgement depends to a large extent on the objectives behind the use of differentiation and the effects of this differentiation (examined in this chapter) and on the market structure where these practices take place (examined in chapter 5). That is why this report does not deal in depth with the techniques used to realise differentiated treatment of traffic on the Internet. However, the methods of implementation, and their efficiency and proportionality in regard to the advertised objectives, raise important questions which deserve to receive a close attention.

3.2 Objectives for and forms of differential treatment

(93) Differentiated treatment of traffic can be done for several reasons and serve a number of different objectives. This section provides some of the motivations for ISPs and network operators to differentiate the treatment of traffic in the

[12] BEREC Report on IP interconnection.

telecommunications infrastructure (access lines, transit lines, switching nodes, etc.).

3.2.1 Legal reasons

(94) Differential treatment of traffic may be applied to fulfil the legal provisions set in the regulatory framework for Electronic Communications Networks and Services (ECNSs). In addition, administrative/court decisions can have an impact on the way ISPs and network operators deal with the management of traffic over their networks. In such cases the differentiated treatment of traffic is not at the ISP's initiative: he is forced to implement a specific treatment to comply with prescriptive court orders (normally court orders taken on the basis of some specific legislation). Some of the usual legal causes that may lead to traffic management techniques include:

- Blocking access to illegal usage of content: in some cases contents available through the Internet can be deemed illegal and banned for public access.
- Copyright protection: Depending on the policy on copyright protection, the availability of some contents may be restricted.
- Emergency situations: National regulations could impose priority use of telecommunications infrastructure for security forces, medical personnel, etc.
- Lawful interception of electronic communications.

National legislations providing for such measures should be compliant with the ECNS regulatory framework, in particular the new provision in Article 1.3a of the Framework Directive: "*Measures taken by Member States regarding end-users' access to, or use of, services and applications through electronic communications networks shall respect the fundamental rights and freedoms of natural persons, as guaranteed by the European Convention for the Protection of Human Rights and Fundamental Freedoms and general principles of Community law. Any of these measures regarding end-users' access to, or use of, services and applications through electronic communications networks liable to restrict those fundamental rights or freedoms may only be imposed if they are appropriate, proportionate and necessary within a democratic society, and their implementation shall be subject to adequate procedural safeguards* (…)".

(95) By nature, these reasons are generally considered legitimate and not of an economic nature. However, their implementation should be carefully framed (proportionality, efficiency), as their often intrusive nature can have significant side effects. In-depth discussion of these matters is nevertheless out of the scope of this report.

3.2.2 Network security and integrity

(96) Traffic management can also be essential to achieve and maintain network integrity. Different adverse conditions may require routine or specific traffic management techniques to be applied. Some examples of such adverse conditions and responses in terms of traffic management are:

- Outages: transmission or routing elements out of order. In this case, traffic management is applied for automatic traffic redirection and congestion management in order to restore minimum performance levels and/or equilibrate traffic among different elements.

- External attacks: Denial of Service (DoS), flooding attacks or DNS impersonation. In this case, traffic management is used for identifying and blocking packets coming from suspicious sources.

(97) In general these types of differentiation can be classified as efficiency enhancing since they aim at securing a certain level of performance in terms of security and reliability of the network. The objectives behind it are generally seen as legitimate. However, as with legal requirements, the implementation of such measures should be carefully framed in terms of taking into account proportionality and efficiency.

3.2.3 Congestion

(98) Differential treatment of traffic can also be used to reduce congestion. In general, congestion can be caused by two reasons: unpredictable situations that occur on an irregular basis (like statistical fluctuations of traffic flows or fault conditions within the network) or relatively predicable situations occurring at a regular basis (because of failure to increase the capacity of the network according to the growing traffic load). Congestion may result in high latency, packet loss or blocking of new connections with potential impact on service availability and in the end-users' experience. Since the early development of data-networks, congestion avoidance was the prime objective of traffic management. It should be noted that the basic protocols of the Internet (i.e. the TCP protocol) are designed in such a way as to reduce the chances of congestion.

(99) With differential treatment an ISP can selectively limit the bandwidth or throughput of traffic caused by certain types of applications with the aim of reducing congestion. It can do so for instance by limiting the throughput of bandwidth hungry applications such as video on demand or P2P. Conversely, ISPs can also give priority to certain types of traffic to ensure the quality level required for the correct functioning of the application or service in case of congestion. And, as highlighted in the two BEREC reports on transparency and quality of service in the scope of net neutrality[13], the ISPs also have the option to perform application agnostic congestion management which will have the same effect regarding limitation of the congestion situation of the network but which will not target specific usage. In the different cases one will need to distinguish between the two causes of congestion described in the previous paragraph. Failure to deploy adequate capacity to the network could in some cases be the main reason for the congestion situation.

(100) If differentiations are used, they can be implemented in such a way that they apply only in case of actual congestion ("need based (de-)prioritisation") or in an active way, meaning that the prioritisation or de-prioritisation applies at any time irrespective of the emergence of congestion.

(101) In general these types of differentiation may be classified as efficiency enhancing since they aim at securing a certain level of performance of the network and may lead to a more efficient use of existing network capacity. The impact on end-users can however be different depending on their use of the Internet. For instance, blocking or de-prioritisation of P2P traffic improve the user experience of some users while at the same time worsen the user experience for those who use

[13] Guidelines on Net neutrality and transparency: best practices and recommended approaches; http://erg.eu.int/doc/berec/bor/bor11_67_transparencyguide.pdf
A framework for Quality of Service in the scope of Net Neutrality: http://erg.eu.int/doc/berec/bor/bor11_53_qualityservice.pdf.

P2P protocols. On the other hand, non-differentiation in pure best effort networks results in a “slim” efficient packet forwarding technology. And providing sufficient capacity to such a simple network design may give a better cost/throughput performance than a complex architecture based on extensive use of traffic management to implement differential treatment.

3.2.4 Differentiation of services to end-users

(102) Differential treatment of traffic can be applied by operators to provide performance-specific offerings to clients. Operators could apply differentiated pricing for such offerings while the user could select the contract most appropriate for his/her needs. This practices could involve:

- Limitation of the bandwidth of the Internet access under different conditions (either permanently, after a download/upload capacity is reached, during most busy hours, etc.)
- Different quality levels (normal, premium, etc) for all types of traffic on the Internet access service regarding delay, jitter or any other key performance indicator.
- Prioritized delivery for selected type of traffic on the Internet access service, e.g. all real-time applications as VoIP or video streaming.
- Traffic blocking services, e.g. protection from spam, blocking (limiting) access to specific content as adult or web sites propagating violence (parental control). ISPs may in those instances offer “filtered Internet access services”.
- Specialized services (e.g. IPTV) providing end-to-end quality of service delivered in parallel to the Internet access service.

(103) The forms of differentiation mentioned above can be classified economically as forms of product differentiation on the basis of capacity, usage, quality and content offered.

3.2.5 Differentiation of services to CAPs

(104) This refers to differentiation in the conditions under which CAPs get access to the end-users connected to a particular ISP. Certain CAPs or certain content or applications services could receive a higher priority or otherwise higher quality while paying a premium rate to the ISP. As a result, this traffic would be delivered faster or with a higher quality (in terms or jitter, delay, latency) over the ISP's network in comparison to the best effort quality. Such prioritisation or differentiated quality level would have to be agreed in a contract between the ISP and the provider of such contents/application.

(105) The differentiation would be restricted to the part of the Internet that is controlled by the ISP (its own transport network and the access segment connecting the user) and therefore prioritised delivery of content/applications would be restricted to the ISPs network as well. End-to-end quality could be achieved by interconnecting directly between ISPs and CAPs, or possibly in the future using QoS-based IP interconnection.

(106) It should be noted that these differentiation practices can be applied in different ways. They can be applied to a certain type of traffic (for instance video traffic), to certain types of applications (for instance IP messaging applications, VoIP applications) or to certain providers of content and applications. Furthermore,

differentiation can be provided as a characteristic of the Internet access service itself, or as specialized services provided in parallel to the Internet access service.

(107) The forms of differentiation mentioned above can be classified economically as forms of product differentiation on the basis of quality attributes. The economic assessment of these types of differentiation depends on the specific situation. On the one hand they can potentially be efficiency enhancing since they serve a demand for higher quality. On the other hand they can also affect the relative quality available for other CAPs that do not wish to pay for higher quality and this could have a negative impact on overall efficiency. Alternatively, over provisioning of capacity in a simple best efforts network could be used to achieve high cost/throughput performance, leading to an open network serving all purposes.

3.2.6 Protection of existing business

(108) Traditional services such as voice or TV are more and more being offered on top of Internet by specific CAPs outside the control of the network provider. Examples of these “over the top services” are VoIP applications, IP messaging applications, or video on demand services. These “over the top” services may act as a substitute for the traditional voice, data or video services of the network operator and may therefore threaten the existing business of a telecommunications provider.

(109) When an ISP is integrated in the sense that it also offers other services to the client such as voice telephony, there is a potential incentive to block or de-prioritize access for end-users to competing “over the top” services. In some cases the access to these applications is restricted in the “standard Internet access service” while at the same time it is available at an extra charge in a separate tariff plan. The objective of protecting existing business models can also apply to contents or applications provided on top of Internet which directly compete with the content or applications of vertically integrated ISPs.

(110) Blocking, de-prioritising or charging extra for the provision of over the top services can be classified economically either as differential pricing or behaviour that potentially results in anti-competitive foreclosure and excessive pricing, depending among other on the position of the ISP concerned in the relevant market. The economic effects of these types of differentiation depend on the specific circumstances under which they are applied.

3.3 Types of effects

(111) In the light of the lively “net neutrality” debate, this report aims at assessing the impact on end users of the differentiation practices described above that are or may be conducted by ISPs providing the end users with internet access.

(112) From an economic analysis point of view, differentiation practices are commonly seen as a positive outcome of the functioning of a market, as they tend to increase the diversity of offers on the market and the adequacy of the supply to the demand of the end-users, resulting in higher welfare for end-users. Nevertheless, it can be that the functioning of the market results in the implementation of some differentiation practices that have a negative impact. This could in particular happen because both the incentives for the ISP and the evaluation by the end-users do not (or do not sufficiently) take into account indirect effects and medium or longer term effects, i.e. externalities or so-called network effects.

(113) In view of these considerations, it appears helpful and useful to conduct a more detailed assessment of the impact of different differentiation practices on the end users. By assessing the "impact", it is meant evaluating whether the implementation of this practice results in an increase, stagnation or decrease of the welfare of end-users.

(114) As the Internet consists of several entities which are linked by various interactions, several direct and indirect mechanisms may have an impact on end-users' welfare. In this section, we review these mechanisms (or "effects") in order to set up the list of topics that have to be examined when assessing the overall impact of a selected practice on the end-user.

3.3.1 Direct (short term) effects on end-users

(115) This section is about the effects that directly and immediately impact the welfare of the end-user.

(116) First, end-users can be directly affected by differentiation practices. Any measure that changes either price or quality of services delivered to end-users, which limits or enlarges their choice, which restricts or enforces their possibility to use the Internet access service, etc. is likely to have an immediate, either positive or negative, impact on end-users' welfare.

(117) In order to be a concern for the purposes of this report, end-users need to be harmed by the behaviour which means that the intensity of the impact should be evaluated. For instance, if an application that did not have very many active users was blocked then immediate impact might be relatively limited. However, the fact that the application has been blocked would have an impact on the ability of other users to ever select this application. A measure that reduces the choice available to users could thus have a negative impact on welfare. The impact of a practice also depends on the number of end-users that are potentially affected.

(118) As a consequence, the availability of alternative offers allowing for the use of that application (by the same provider or alternative providers), among others, is likely to reduce the impact, as the user may change offer or switch provider. In such a case, the incentives to switch, namely the negative impact incurred by the blocking, nevertheless have to be assessed against the switching costs.

(119) Beyond these specific effects, one of Internet's strengths lies in network effects: each user benefits from the growing number of users, as it creates new possible connections. Differentiation practices that tend to exclude some users from the network, by limiting the proportion of services they can access, may have a chilling impact on the global community of Internet users.

(120) Lastly, it should be noticed that the end-user is not always fully able to determine what specific features he needs from an internet access service, all the more on a forward looking basis. Internet services often evolve; the way they are delivered may be quite diverse even between two services of same nature; and the prescription of usages by other end-users is usual.

(121) In addition to these direct impacts, some indirect mechanisms may involve ISPs and CAPs before affecting end-users.

3.3.2 Indirect (medium and long term) effects on end-users through the evolution of electronic communication services market conditions

(122) This section is about the effects that impact ISPs, either immediately or over time, and that then have an impact on the end-user in the medium or the long term.

(123) Differentiation practices could be initiated by one or several ISPs which can make new stream of revenues, for example, from prioritizing contents (and slowing down others) or extracting value from a content provider by charging it for the access to its end-users. In certain circumstances, these practices might have an impact on competition. A decrease in the level of competition is expected to harm the end-users' interest, by reducing their choice and possibly allowing for higher prices and/or lower quality, while a higher intensity of competition is expected to positively affect end-users' welfare. Nevertheless, this question of distortion of competition between ISPs on retail broadband internet access markets is neither specific to differentiation practices nor key in the net neutrality debate, as these markets are broadly competitive in Europe and no operator is in position to extract sufficiently more value from an end-user in order to distort competition.

(124) On a longer timescale, beyond an adequate level of competition, a sufficient incentive to invest is needed for ISPs to foster the development of broadband infrastructures (that is next generation access networks). Differentiation practices, like charging end-users or CAPs for a better quality of service, may help operators to develop their revenues. Insofar as these additional earnings may contribute to the funding of networks (i.e. they correspond to reasonable and sustainable business models covering the costs of the infrastructure) they would have a positive effect on the long-term users' interest which have to be compared with other, possibly negative, effects.

3.3.3 Indirect (medium and long term) effects on end-users through the evolution of content and applications market conditions

(125) This section is about the effects that impact CAPs, either immediately or over time, and that then have an impact on the end-user in the medium or the long term.

(126) As far as CAPs are concerned, differentiation practices convey the risk of reducing the intensity of competition between application and content providers. It is generally acknowledged that end-users' welfare is higher when they benefit from a larger choice. It also has to be noted that the Internet's growth and success is largely related to its specificities as an open platform:

- universal connectivity, which means that any end point of the network can access any other end point;
- the separation of the network and application layers , which guarantees that all applications are, by default, accessible in similar conditions;

which among others have the following consequences:

- low entry cost, which allows almost every person or company to start accessing and distributing information;
- innovation without permission and from the edge, which means that new applications can be tested and made available on the Internet without any barrier or prerequisite negotiation (so called *garage economy)*.

(127) Furthermore, differentiation practices may have different impact depending on the size of the CAP. The introduction of different tariffs or technical conditions (e.g. different QoS schemes) could be seen as an entry barrier for some CAPs, like new and/or small providers and non- profit offers. There is a risk that this may negatively

affect end users' welfare. Whether or not that is likely to be the case depends on several factors that are difficult to envisage given the absence of concrete examples of this type of practices. For example, it could be that all CAPs would have to pay, in order to avoid a too low quality, and this may be a problem for not for profit services. On the other hand, an increased contribution to funding from the CAP side could result in lower tariffs set by ISPs for connectivity services delivered to end users. It appears that the effect of such practices, which are already partly implemented in some cases, is not easily measurable.

(128) Any practice that challenges these specificities may affect the Internet's strengths and may lower (or increase) its interest for end-users. This question of the impact of the practices of ISPs on the markets of content, applications and services is key in the debate on net neutrality.

(129) On a long term perspective, the intensity of innovation could well depend on the permanence of the open platform aspects. Dividing the Internet into several separate networks, increasing entry costs, differentiating quality depending on applications, introducing innovation control or sending any signal that makes these perspectives credible may make innovation harder and result in a lower growth of new applications.

(130) However, it can also be argued that a reasonable differentiation of performance offered by operators to CAPs could spur the development of quality-dependent innovations. The interest of end-users greatly lies in the preservation of the Internet's openness and neutrality, but allowing a sensible level of differentiation may not necessarily be harmful as long as the performance of the best effort service is maintained.

3.4 Scope of the analysis in the context of this report

(131) As stated above, the objective of this report is to provide a conceptual framework for analysis of the economic effects of different forms of differentiation on competition, innovation and end-users' welfare. Therefore the report will focus on differentiation objectives that have a predominantly economic nature. These are: congestion, differentiation of offers to end-users, providing differentiated services to CAPs, and the protection of existing business. These objectives provide broad room for strategic choices based on economic considerations while the remaining objectives ("legal reasons" and "network security and integrity") are considered important for the operation of a network providing Internet access (see above discussion).

(132) To assess the impact on end-users' welfare, the report will take into account both direct (due to the impact of the practice in prices or/and quality) and indirect (impact of the practices in the competitive level and future innovation) effects.

4 Conceptual toolbox for the assessment of practices

(133) In this section, we set out a conceptual framework for the economic analysis of the differentiation practices listed above. As described above, such practices could have positive or negative effects depending on the market structure. For this reason, firstly, it is useful to discuss, at a broad and illustrative level, the possible characterisation of the relevant markets where the services affected belong. The remainder of the section then deals with the incentives to discriminate - mainly from the perspective of the ECP - under different scenarios depending on whether there is SMP and/or there is vertical integration. Such incentives may vary depending on the market power held by the network operator and the services provided, in particular, if the services provided by a CAP compete directly with the services of the ECP.

(134) As we have discussed above, differentiation practices undertaken by ECPs may have a direct effect on end-users but they can also be affected indirectly via practices that are primarily targeted towards CAPs. The differentiation practices by ISPs that are aimed at CAPs are only analyzed for the purposes of this report to the extent that they may have an effect on end-users (e.g. who may be provided with lower quality services if ISPs were differentiating between CAPs).

4.1 Characterization of relevant markets

4.1.1 Introduction

(135) It is useful for a discussion about competition issues related to net neutrality to start with an understanding of the types of relevant markets that could be affected. Therefore, this section builds on the discussion of the Internet value chain set out in section 2 and discusses market relationships which are relevant for the framework set in section 4.3. This analysis should be seen only as a useful tool to better understand the analysis in the next sections and not as an indication that BEREC believes that some of the markets could be clearly identified under the European framework.

(136) It is well known that market definition is not an end in itself, but it is part of the process of assessing the degree of market power (SMP) that a firm may have and in case the market is part of the regulatory European framework assessing whether ex ante regulation is warranted (three criteria test). As noted in the EC Guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services[14], there are two main competitive constraints to consider in assessing the behaviour of companies on the market: (i) demand-side substitution; and (ii) supply-side substitution. In addition, a third source of competitive constraint on an operator's behaviour is the potential for entry into the market and which differs from supply-side substitution in terms of requiring a longer period of time for entrants to start supplying the products or services that are subject to analysis. Economic

[14] OJEC C165/6 of 11 July 2002.

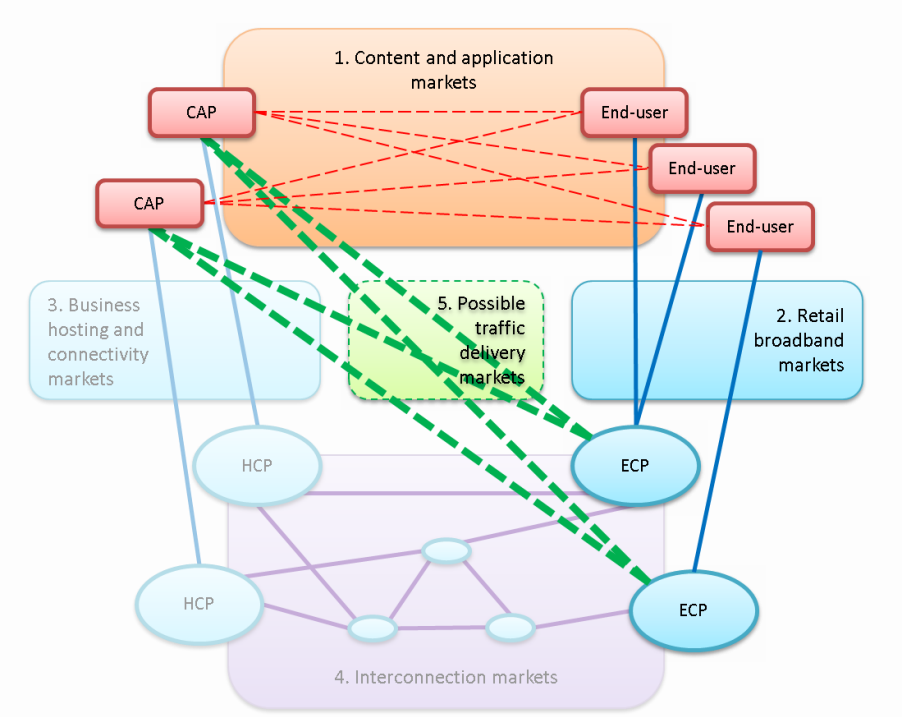
agents interact in a given economic market, which has both a product and a geographic dimension.

(137) Below we explore issues related to market definition in the context of net neutrality and differentiation practices. Again, the purpose of this section is not to reach definite conclusions on the definition of the relevant markets but rather to illustrate the sorts of markets that could be affected by differentiation practices.

(138) On the CAP side, delivery of content and applications is part of a complex process, in which an important number of transactions (as well as of different services) may be involved before the services are finally delivered to the end-user via the ISP to which the end-user subscribes. On the end user side - and more important for the scope of this report - is the relationship between the ISP and the end customer that obviously must also be taken into account.

(139) Below is the representation of the value chain which has already been introduced earlier in the document, with a potential additional relationship between CAPs and ECPs highlighted (the green dotted lines in the diagram). The subsequent discussion is based on this representation of the Internet value chain. It should be noted (as stressed throughout this document) that the complex relationships prevailing in the Internet ultimately enable the end-user to benefit from the content and applications provided by CAPs.

Figure 8 – Detailed representation of the value chain



4.1.2 ISP – End-user relationship

(140) The relationship between ISPs (or more in general, electronic communications providers) and end-users has traditionally fallen within the remit of NRA‘s areas of

activity, even if it must be noted that generally retail markets are not subject to SMP regulation[15].

(141) In this report, these ISPs are called end user connectivity providers (ECPs) and grant connection to end-users on the retail broadband and internet access markets (Market 2 on the diagram).

(142) Broadband access can be either fixed broadband access or mobile broadband access. Fixed and mobile broadband access have generally but not in all cases been deemed to belong to two separate product markets[16].

(143) On the other hand, to fully understand the ISP-end user relationship in the net neutrality context, and the differentiation practices that may emerge, it is useful also to take into account the services that are being provided over the broadband connection. Such services may include services like VoIP or content services (such as IPTV or VoD). The exact delineation of the services that are provided via the broadband and internet access connection, and that may be affected by the differentiation practices, will need to be assessed on a case-by-case basis.

4.1.3 CAP – End-user relationship

(144) Content and application markets cover a range of diverse and complex interactions between providers and users and the boundaries between the different markets can evolve over time.

(145) For example, video content can be exchanged via P2P file sharing, streaming or progressive download, which may be partially or completely substitutable. There is also then the issue of the extent to which they are substitutable with DVDs. It may be that they form a single market.

(146) Most of these markets are significantly different from electronic communication services markets and are not part of the regulatory framework. In those cases abusive practices of SMP providers are controlled by competition authorities. However, some applications do share similarities with electronic communication services and could evolve into electronic communication services over time. For instance, there could be a question about the extent of the distinction between voice and instant messaging services provided over IP.

(147) There will be a need to consider the definition of the relevant content or applications market on a case by case basis.

4.1.4 ECP – CAP relationship

(148) The CAPs business model requires CAPs to purchase Internet access as well. CAPs are provided services from HCPs or other agents to be able to deliver their content across the Internet.

15 As noted in the EC Recommendation on relevant markets, the starting point for the identification of markets in generally the definition of retail markets from a forward-looking perspective, taking into account demand-side and supply-side substitutability. Having defined retail markets, it is then appropriate to identify relevant wholesale markets, which are the ones that are usually subject to ex ante regulation based on the existence of SMP.

16 See in particular Case AT/2009/0970, where it is concluded that mobile Internet access is on the basis of the particular circumstances of the case a substitute for fixed Internet access.

(149) Delivery of content and application services to the end-user by CAPs is characterized by a broad array of complex relationships, on which basis different economic models may emerge[17]. Most CAPs only contract with a single HCP (so-called "single-homing"). However, some CAPs may engage relations with several providers (so-called "multi-homing"), including transit providers, content delivery networks and some ECPs, in order to optimize their traffic delivery conditions (cf. 2.3.1). Nevertheless, their number remains significantly smaller than the total number of ISPs involved in the Internet.

(150) What is important for the purposes of this report is that via such complex relationships, content and applications services are delivered to the end-user. ECPs with whom the end-user has a relationship can be thought as the last part of a process thanks to which CAPs, on the one hand, and end-users, on the other hand, interact (ISPs being an intermediary through which such relationship takes place).

(151) Even if most CAPs do not have (at least for the time being and besides those having own infrastructure being able to directly interconnect) a direct relationship with the ECP from whom the end-user gets Internet access, the ECP is anyhow providing a service to the CAP, either directly or indirectly, consisting in delivering the traffic originated by the CAP and demanded by the end-user. On the other side CAPs provide services to the ECP as their contents or applications contribute to the attractiveness of the ISP's internet access offer.

(152)

(153) This interaction is reinforced when ECPs practice differentiation on a traffic stream that originates from a CAP. This *traffic management practice* involves two parties – either voluntarily or not - which generally have no direct commercial relationship. However, the practice itself may induce some reaction, either that the practice is not desired by the CAP and that he opposes to, or that the CAP is demanding for the differentiation and is ordering it (cf. 2.3.2). This could form the basis of relations for differentiated delivery (relation 5) for each ISP, something which is too marginal to be called a market at this point in time, but could become a sort of a market if it really ever developed.

4.2 The Internet and two sided markets

(154) In this section we discuss the implications of two-sided market theory for competition analysis in relation to the internet and net neutrality.

4.2.1 Two sided markets theory

(155) The spread of new forms of traffic management and the parallel evolution of the Internet ecosystem (characterized by continuous growing traffic, diversifying service requirements, increasing competition among different types of agents, and multiple

[17] For a more detailed description of the agreements that are entered into in the Internet ecosystem, see e.g. OFT's decision of 30 August 2011 regarding the merger between Level 3 Communications Inc. and Global Crossing Limited.

transactions both at the retail and wholesale level) raise issues related to income distribution, i.e. the allocation of resources among the industry players, and the production of income, i.e. the efficiency of the system[18]. Closely linked to this are issues related to the promotion of innovation and the determination of the incentives to invest, both in content and infrastructure, for the various stakeholders in the supply chain. The literature on two sided markets provides a possible framework for interpreting issues of relevance to the Net Neutrality debate, as already pointed out by the European Commission[19] and Ofcom[20] in 2010, and AGCOM,[21] in 2011, in the public consultations held on the Net Neutrality issue and by academic articles[22].

(156) A two sided market can be described as a market where two distinct user groups interact through an intermediary or platform. In the Internet access market case the two groups of users involved are (i) Internet end-users and (ii) agents who render available contents and applications in the Internet (CAPs). The Internet can thus be seen as the platform over which these different user groups interact with ISPs acting as intermediaries. The two-sided market approach can thus provide a framework for analysing the different economic relationships that exist between different user groups, including platform intermediaries.

(157) Because of the two-sided-market characteristics, the decisions and market access conditions of each user group influence what happens to the other user group. This influence comes from the externalities that each side of the market imposes to the other side[23], which is often referred to as a "network effect".

(158) In the case of the Internet access, the externalities are mainly positive for both sides and derive from the increase of utilization of the Internet platform by each side:

- More end-users accessing the Internet represent more possibilities of revenues for CAPs;
- More CAPs accessing the Internet represent more possibilities of more and better contents and applications for Internet users.

(159) That said, there can come a point at which there are so many users that there is a negative externality in the form of congestion.

(160) As mentioned above, ISPs (taken together) are the intermediaries between these two groups. The price for Internet access and the quality provided to end-users and CAPs are instruments that influence the participation of each group in the platform. It is important to have in mind that due to the externalities referred to above, the price charged on one side of the market affects not only the participation

[18] Regarding scarce capacity, the traffic on the Internet has always been increasing rapidly, and this is in no way a new situation.

[19] EC European Commission, Information Society and Media Directorate-General, Electronic Communications Policy, "Questionnaire for the public consultation on the open Internet and net neutrality in Europe", 30 June 2010.

[20] OFCOM, "Traffic management and 'net neutrality'. A discussion document", 24 June 2010. Ofcom's approach to net neutrality has been further developed in a document published on 24 November 2011.

[21] AGCOM, public consultations nn. 39/11/CONS and 40/11/CONS "Neutralità della rete", 3 February 2011, and n. 714/11/CONS, 20 December 2011.

[22] E.g. Economides N. And Tag J., "Net Neutrality on the Internet: a Two-sided market analysis", NET Institute Working Paper No. 07-45, 2009

[23] An externality is a cost (negative externality) or a benefit (positive externality) incurred by a party who was not responsible for the action causing the externality.

at that side of the platform but also affects the other side's participation and vice versa. For instance, if the price charged to end-users was increased there would be fewer end-users accessing the Internet and, in consequence, the incentive for CAPs to access the Internet would diminish significantly.

(161) In the same way, the quality of access (e.g. in terms of speed, delays, etc.) affects the range of services that CAPs can provide to the end-users. ISPs may face some pressure from some stakeholders to upgrade their access networks, so that a wider range of enhanced services may be delivered over the Internet.

(162) Application of the two sided market theory is limited by the fact that the Internet does not consist of a single platform where price structures on both sides are coordinated, but of many networks which hold dynamic and complex negotiations to set prices which are not fully controlled by any entity. Consequently, we recognise that in practice two-sided market analysis may not be applicable to every economic relationship that will exist between end-user and agent. In situations where CAPs directly interconnect to ECPs, ECPs may however become closer to double-sided platforms setting prices on both sides. A same situation may occur when traffic management practices induce a relationship between CAPs and ECPs.

(163) Despite the fact that the two sided market theory does not match perfectly in the context of the Internet economy, some features of the relations established between the parties in the Internet value chain fit in this theoretical framework, helping to get a better understanding of the multilateral connections of market players in the Internet economy and its implications for the net neutrality discussion.

(164) Once explained why Internet access could fall under the theoretical framework of a two sided market model, it is important to understand how ISPs have handled this issue until now, and the challenges and consequences of the application of this theory in a forward looking analysis.

4.2.2 Implications of the two sided markets theory in the Internet world

(165) The fact that until now the ECPs have not charged CAPs, mainly because of the "*no-commercial relation practice*" and because ECPs mainly bought their upstream connectivity (as transit) or exchanged it between peers, does not prevent them from applying other tariff schemes in the future[24].

(166) Charging is already observed between ISPs (and more specifically between ISPs and HCPs) on interconnection markets. Some of these players are also discussing QoS-based agreements, which could support new charging arrangements in the context of interconnection relationships. These developments involve ISPs and may affect CAPs only indirectly. However, some CAPs are also developing direct relations with ECPs that relate to the quality of the service delivered to the end-user. These interactions could lead to more explicit charging arrangements between CAPs and ECPs.

(167) In the light of these developments, it might be possible that in future the socially optimal and the equilibrium prices/quality in a two sided market may involve a move towards each individual ISP is charging both CAP and end-users for providing connectivity to content. However, from the actual point of view, such an outcome is

[24] Tariff schemes should be understood in this context as a set of linked characteristics such as price, quality, etc.

not very probable because such variables depend on the relative willingness to participate in the platform of each group of users and on the relative cross-group externalities between end-users and CAPs and on the transaction costs for implementing non-linear prices divided to different market partners. Developing relations and charging between ISPs and CAPs does not imply necessarily that the optimal outcome cannot be reached.

(168) It is nevertheless important to consider that Internet access prices for end-users and CAPs may have important static and dynamic effects regarding innovation in content and applications, as well as in investment in electronic communications networks. Consequently, the change in the Internet ecosystem (directly or indirectly by regulation or other means) may affect significantly the incentives to invest and innovate for CAPs and ISPs, respectively, in content and infrastructure (e.g. bandwidth improvements).

(169) However, in general terms, , absent regulation and in an effective competitive environment, providers could take into account these externalities and two-sided markets could be expected to work well for consumers. In such situations our initial position would be that such arrangements would be a commercial matter between parties and ISPs and CAP providers should be free to explore new business models. However, there could still be situations where due to the market power of the platform provider (in this case, the ISP), market mechanisms could end up with inefficient results. For instance, if charges from ISPs to services providers were to become the norm for a wide range of services this could increase transactions costs and could have an impact on innovation in internet-based services.

(170) Most of these concerns are likely to relate to issues around IP interconnection and its evolution, and so does not fall within the scope of this report. However, these elements will be relevant in the assessment of the possible developments in the *"no commercial relation practice"* field.

4.3 Ability to differentiate / discriminate and effects on end users

(171) This section aims at providing a general framework for the analysis of the risk of end -users' harm derived from differentiation practices.

(172) Many of the practices described in Section 3 could have both negative and positive effects on end-users. In fact, often the same practice could have both effects. Therefore, it is important to understand better under which circumstances concerns may emerge.

(173) The intention is to start by identifying broad scenarios irrespective of whether or not an individual NRA may conclude that there are risks or concerns. These scenarios try to catch the different underlying incentives for the ECPs implementing differentiation, i.e. foreclosure, increase profitability, cost reduction, etc. There is also the need to take into account the impact on consumers in relation to specific market circumstances and developed into a theory of harm that can be evaluated.

(174) We propose to identify broad scenarios by distinguishing between whether:

- there is some degree of market power (Significant Market Power, or "SMP") or not; and
- ISPs are vertically integrated or not.

(175) According to the above scenarios, market power is an important factor of our analysis because it can be seen as an indicator of the ability of the operator

undertaking a discriminatory practice to affect the market whereas the vertical integration could incentivise such practices as the operator is competing with the CAP in the provision of the retail service.

(176) Market power has to be assessed with regards to a relevant market. Although it is not the aim of this report to define relevant markets, in the previous section we have delineated potential markets that could be identified according to the relationships identified (see Figure 8 above). As this exercise is solely for the purpose of illustrating particular potential concerns, it is not necessary to detail in greater extend it with the geographical dimension of the market.

(177) Table 1 visually illustrates this simple taxonomy and distinguishes between three cases where there is:

- SMP and vertical integration;
- SMP but no vertical integration; and
- No SMP and providers may be either vertically integrated or not.

Table 1: A Taxonomy of concerns based on features of ISPs

<table>
<tr><td colspan="2"></td><td colspan="2">SMP? (in retail level (market 2 in the figure 8 above) or in the potential market characterized by the relationship described as number 5 in the figure 8)</td></tr>
<tr><td colspan="2"></td><td>Yes</td><td>No</td></tr>
<tr><td rowspan="2">Vertically integrated?</td><td>Yes</td><td>Potential exclusionary concerns could arise under either a SMP finding at the retail level (market 2 in the figure 8 above) or in content and application markets or behave independently of its competitors in connection with the ISP- CAP-relation as a result of the management traffic practices (number 5 in the figure 8 above). We refer to this situation Scenario 1 in the following sections.

In addition, there are also potential concerns about the degradation of best efforts by the SMP operator although discriminatory practices do not have the aim of distorting competition.</td><td rowspan="2">In this situation there is no SMP operator either in market 2 of the Figure 8 above or in content and application markets or ECP-CAP relation (number 5 of Figure 8). In this case potential concerns relate to the degradation of best efforts Internet and the implications this may have on the incentives to invest and innovate by CAPs (Scenario 3).</td></tr>
<tr><td>No</td><td>In this situation the SMP position is located in the potential market resulting from management traffic. In this case the main concerns relate to unfair conditions imposed by operator as a result of these practices with the aim of exploiting its position in the market (through excessive prices). We refer to this situation as scenario 2. Again, as in scenario 1, degradation is also an issue in a situation where the operator has SMP but is not vertically integrated.</td></tr>
</table>

(178) We examine each of these scenarios separately, after a brief discussion about market power and vertical integration concepts.

(179) The degradation of best efforts and its impact on the incentives to invest are common on all situations, regardless the position of the operator in the market. However, the impact in the market is logically different. To make the explanation

clearer, for scenarios 1 and 2 we will analyse, in the following paragraphs the specific features of each scenario, leaving the common elements on degradation to scenario 3.

4.3.1 SMP & vertical integration concepts

(180) It is generally accepted that concerns about exclusion of providers may exist when the provider has some degree of market power, which is in broad terms the ability to price above cost.

(181) The market power threshold adopted here is that of significant market power (SMP). A general definition of significant market power is the ability of a firm to behave independently from its competitors and end-users, for example, by raising prices above some competitive level in a profitable way for a non-transient period. This is the legal concept used in the electronic communications regulatory framework and by competition law. While there may be a debate as to whether SMP is the appropriate market power threshold to identify concerns in the area of traffic delivery differentiation practices[25], we have taken this as a given for the purposes of this paper.

(182) In a situation in which an ECP has SMP, the provider could have an incentive to exclude rivals, reduce quality and costs or increase prices and each of these may harm end users. The behaviour may generate both short-run static detriment – i.e. higher prices and less choice for end-users – and longer-run dynamic detriment – i.e. less investment and innovation. This is because of the deterrence effect that exclusionary behaviour may have.

(183) It is possible that SMP could be established in a number of markets. Some ECPs may hold SMP on certain retail broadband markets. However, it might also be considered useful, in the future, to take into account the ECP's market power when adopting traffic management practices and the potential relationship that could arise with respect to CAPs.

(184) Should an ECP be identified as having SMP in a market comprised by regulatory framework, the regulator's action would first focus on dealing with this SMP as a way, inter alia, to achieve the disappearance of the undesirable practice. In general, assuring effective competition is the most appropriate way to restrict the ability of the SMP operator to distort competition and harm end-users. The current regulatory framework provides tools, in particular wholesale regulation, to deal with situations where the market is not behaving in a competitive manner. On the other hand, in the process to achieve this market situation, a direct action to prohibit the practice would be a temporary, second best option.

(185) Regarding vertical integration, for the purposes of this report, vertical integration refers to the combination of activities that belong to different levels of the supply chain. A classic example of vertical integration is the integration of manufacturing and distribution activities. Consequently, when using vertical integration in this report we may be referring to the integration of ECPs with other parties of the value chain, namely CAPs. However, this term may also be related to the provision of services that, while closely related, do not form part of the same market, such as the provision of telephony and video services by an ECP.

[25] As they result in the modification of small characteristics of internet access offers which may not be as much subject to full competitive pressure as prices and services.

(186) The existence of vertical integration may affect the ability and incentives of operators to compete in the marketplace. In particular, integration may change the incentives of a supplier to continue to deal with third parties, leading to foreclosure of rivals in upstream or downstream markets (input/customer foreclosure) e.g. via denial of access to inputs or distribution platforms that are essential to efficiently operate in the market. The limitation of the capacity of rivals to have access to essential supplies or markets may in turn give rise to the vertically integrated operator being able to profitably increase price or restrict output, to the detriment of end-users.

(187) This however does not mean that the mere existence of vertical integration will lead to anticompetitive conduct; such a premise would obviously have to be tested against the specific facts of the case.

(188) For the purposes of this report, the reference to vertical integration should be understood in broad terms. It refers, on the one hand, to instances of "pure" integration, whereby the services are provided by the same economic unit, be it one single company or in the context of a parent-subsidiary relationship (the ECP being in all cases able to exert decisive influence over the course of action of the services it places on the market). It also refers to softer forms of integration, whereby through e.g. contractual agreements or other non-structural links the ECP is able to have exclusive or quasi-exclusive[26] access to an input or downstream facility which is being traded in the market.

4.3.2 Scenario 1. ECP with SMP and vertically integrated

(189) The first scenario is one involving differentiation practices carried out by an ECP that has SMP in the relevant market and which affect a service/content that is also being supplied by the ECP. As it has been said above, we refer to markets 2, to content and application markets and to the potential CAP-ECP relation number 5 of the Figure 8 above. In this case, the underlying incentive to differentiate may derive from ensuring that the ECP does not face competition in the provision of the service/content i.e. seeking to exclude competitors. Concerns may also arise from the SMP resorting to other practices, such as degradation of best efforts Internet. However, in this section only the issues related to foreclosure will be considered, as the problems relating to the degradation of best efforts Internet also apply in a non-SMP scenario and are dealt with in Scenario 3.

(190) In general terms exclusionary behaviour describes a situation where there is a vertical chain and providers have the ability and incentives to prevent rival providers from reaching end-users or get access to an input. In terms of the "net neutrality" debate, ECPs control access to end-users to which CAPs want to provide services.

(191) For example, this case refers to a situation where one vertically integrated ECP excludes rival CAPs, preventing them from reaching the ISP's subscribers. For example, an ISP which alongside Internet access also offers TV content as a specialized service may potentially have an incentive to exclude third party providers of TV content available through the broadband connection to the open Internet.

[26] As a rule of thumb, access to a particular input may be deemed to be quasi-exclusive when it amounts for 80% or more of the total purchases of the good, see e.g. in relation to non-compete clauses EC Regulation No 330/2010 of 20 April 2010, on the application of Article 101(3) of the TFUE to categories of vertical agreements and concerted practices, OJ L102/1 of 23 April 2010.

(192) As a result of behaviour by the ECP(s), CAPs:

- Either cannot get access to end-users (i.e. “blocking”); or
- Can get access but at terms (price or quality) which put them at a disadvantage in comparison to the services offered by the vertically integrated provider (i.e. because of “throttling”).

(193) Under vertical integration there may be an incentive for an ECP to exclude if exclusion led to:

- Incremental profits derived from end-users switching from the blocked application to that of the vertically integrated ISP

which outweigh

- The decline in profits for the ECP due to:

1. The reduction in any “access charges” possibly received, directly or indirectly, from the excluded CAPs[27]; and
2. The fact that a proportion of current end-users may decide to switch ECP altogether (in which case the ECPs would also lose any profits from providing connectivity).

(194) The ability of an ECP excluding a competing CAP, by denying access to, in this case, end-users, also depends on the market power held by the ECP. Without SMP, CAPs could opt to provide the application/service through another ECP reaching a large proportion of end-users. In this scenario, the probability that the decline in profits of the ECP due to customers switching to another ECP is greater than the increase in profits derived from customers switching “service” from the blocked application to the application of the vertically integrated ECP is higher than if the ECP has SMP.

4.3.3 Scenario 2. ECP with SMP but not vertically integrated

(195) In this situation the ECP holds SMP in a relevant market but it is not vertically integrated. In this scenario, the concern is not about the exclusion of rival providers, but unfair conditions levied on CAPs as set out in section 5.1.4 i.e. either through excessive charges to content and applications providers and/or to end-users. Again, degradation of best efforts Internet could be an issue when the operator is not vertically integrated. As set out above, we will address the issue of degradation of best efforts Internet to Scenario 3.

(196) The unfair conditions that can be imposed by a SMP operator have several forms. However, when the aim is not foreclosure but exploitation, the most common situation is imposing the excessive prices, where differentiation is used as a tool to increase overall profitability of the ECP. The effect can be twofold: charging excessive pricing for all or most CAPs; or charging excessive pricing for all or most end-users. These practices may occur simultaneously or only on one side of the market, depending on the different demand side elasticities.

(197) As it has been said above, the existence of a SMP position in the market has to be solved by NRAs applying those appropriate remedies. In particular, in the case of the retail level (market 2), the tools to enhance competition are perfectly identified in the current regulatory framework and have been analysed in other documents of BEREC.

[27] This feature is not relevant today, but may in the future if charging starts to take place.

(198) The situation when this unfair conditions affect CAPs are more related to the Net Neutrality debate and therefore are covered in this report. There is an argument that a change in the current Internet ecosystem, whereby ECPs would start charging CAPs, could lead to a "competitive bottleneck" outcome where CAPs are charged "too much" (and end-users "too little") for accessing end-users even in the absence of any exclusion. Although ECPs currently are not subject to regulation in this area but where applicable under general Competition law, it may be worth exploring the case if they decided to start charging CAPs to access their end-users.

(199) We will discuss this situation for completeness because the arguments have been raised in the economic literature in the context of Internet access being thought of as a two-sided market. However, such situations, according to BEREC data, do not exist or, in any case, if they exist are exceptions. In general, such problems are more related to the interconnection level, which are treated in the BEREC project "An assessment of IP-interconnection in the context of net neutrality" covering qualitative information on the different types of the commercial IP interconnection agreements, as referred to earlier.

4.3.4 Scenario 3 - ECP without SMP

(200) A concern often discussed in the Net Neutrality debate relates to the quality of best effort Internet and the capacity available to offer differentiated services. This is an issue that will be discussed in the particular context of a scenario of an ECP not holding SMP (Scenario 3), but could also be an issue when evaluating the conduct of an ECP with SMP (Scenarios 1 and 2 above).

(201) So far Internet access has mostly been provided on a best efforts basis. This means that all content and/or applications are treated in the same way and in case of congestion no particular applications gets prioritised. The term "mostly" is important as there are some exceptions. For instance, some services are offered as specialized services where some capacity is exclusively reserved for them – e.g. IPTV offers. In other cases, ISPs are starting to manage traffic through their Internet access service offers, in part to avoid congestion and in part to smooth traffic at peak time. So far, these represent exceptions to a general "best efforts" approach

(202) The concern that has been expressed is that if prioritisation becomes widespread then the amount of capacity used along the vertical channels to deliver services that are not prioritised – i.e. on a best-efforts basis – will be reduced. The result would be a reduction in the capacity available for services that are delivered via best efforts – i.e. those which do not require prioritisation, for example because they are not much affected by delays – may mean that the quality of the overall service could decline. For example, these services may suffer more often from congestion than is the case today. This concern abstracts and is separate from the ones identified in the previous sections and, in particular, exclusionary behaviour. Furthermore, this outcome could emerge in the absence of any ECPs having SMP (or even a lower level of market power) and with or without vertical integration between connectivity and content/applications.

(203) This potential concern is not focused principally on static harm from the potential reduction in quality of the best effort services, but on the dynamic implications that this may have on the incentives to invest and innovate of CAPs. The concern is that a lower quality best effort may reduce incentives of existing or new entrants to provide improved content and applications. This is critically important in the case of the Internet given the dynamic nature of innovation on the supply side.

(204) The amended regulatory framework for electronic communications, more specifically the Universal Service Directive has a new provision (Art. 22(3)) which empowers NRAs to impose a minimum Quality of Service (QoS) on provider(s) "in order to prevent the degradation of service and the hindering or slowing down of traffic over networks". This may be an appropriate tool to address service degradation concerns which may arise even in the absence of SMP[28].

(205) Nevertheless, we think that it is relevant to discuss some of the issues relating to a situation in which a reduction in the quality of best efforts could be a concern. In other words, the economics issues that could be relevant where we observe a reduction in the quality of best efforts (countered by an increase in the quality of prioritised services).

(206) If end users were able to express their consumption preferences and, as a result, opted for prioritised or specialized services instead of services that relied on best effort, it would seem difficult to argue that the change has harmed them. But there may be exceptions.

(207) This assessment will be different in the presence of a SMP operator in the market, end users' would be constrained in their ability to choose an alternative source of supply. Therefore, in scenarios 1 and 2, the concerns about degradation are likely to be higher as the SMP operator could behave independently of consumers.

(208) Even if there is effective competition, another possible exception could occur where end-users were rational but short-sighted and opted for prioritised services without taking into account that by doing so they and the other Internet users would be harmed (because their combined choices would deter innovation and, hence, lower the availability and quality of future services). It may be the case that ECPs also failed to take account of this dynamic effect. Therefore, they could suffer – i.e. in terms of reduced profits – if innovation on the Internet declined and reduced the value end-users can obtain from Internet connectivity[29].

(209) Another argument that has been put forward is that currently the Internet based on best effort allows all ideas about new content and applications to be tried out. If best effort was negatively affected, innovation in content and applications may also be negatively affected. This argument raises interesting questions. The pros of having unhindered access is that ideas get tried out and end-users would be the ultimate judges of whether some content or application will succeed or not. There are, however, some cons. While it seems true that the best efforts Internet allows anyone to put forward new content and applications to be judged by end-users, it is perhaps unclear whether or not this would generate the best outcome for end-users in all circumstances. For example, CAPs will not necessarily take into account the impact that their offers may have on congestion – e.g. P2P applications. But these concerns could easily be eased by applying application-agnostic congestion management. ISPs, unless they were short-sighted, would have an interest in making promising content and applications available to end-users. They will also act like retailers of other offers and would initially screen those content and applications that are worthy of being given priority and those that are not.

[28] Specific work on this remedy is being undertaken by BEREC.

[29] For example, they may enter priority agreements with service providers but at the same time aim to reserve part of the capacity to best effort to ensure that the future value of Internet connectivity would not decline.

(210) Other considerations are relevant in considering whether widespread prioritisation would negatively impact best effort and innovation in content and applications. Absent exclusionary behaviour, prioritisation could provide important benefits to end-users, as highlighted in Section 3. For example, it could allow ISPs and end-users to provide better quality of services for those applications that are delay sensitive. It could also allow ISPs to manage network traffic by smoothing peak traffic and to ensure that those end-users and CAPs who make most use of the network capacity face the correct price signals. Therefore, in order to examine the impact that widespread prioritisation may have on best effort and the impact this may have on the incentives to invest and innovate of providers that rely on best effort, NRAs should also consider the impact of such development on:

1. the ISPs' incentives to invest and innovate in their networks; and
2. The incentives of CAPs who need priority because the value of their services – e.g. gaming – is sensitive to delays and, hence, rely on a prioritised service to invest and innovate . Or whether this could be achieved by over-provisioning of capacity in best efforts networks.

(211) This reflects the fact that the value that end users obtain from the Internet depends on a set complementary inputs – i.e. the quality of their network connection and the availability of content and applications.

(212) Therefore, we consider that differentiation practices could be welfare enhancing as far as they allow innovation in the services and as long as they grant the appropriate provision of certain services sensitive to the quality of the network. However, this approach has to be consistent with the fact that best effort Internet access should be of sufficient quality to support those Internet based services which are particularly dependent on low transaction costs and a large addressable market.

5 Analysis of differentiation practices

(213) The analytical framework presented in the previous chapters suggests analysing a specific differentiation practice (and its presumed capacity to harm competition and end-users) using a two steps procedure. That is, we start from the description of the service potentially affected by traffic management (service characterisation), and we identify i) the commercial practice under scrutiny (commercial characterisation) and ii) the relevant markets affected by the practice, then a differentiation practice may be assessed on the basis of whether or not one or more providers have Significant Market Power (SMP) and whether or not ECPs are vertically integrated. Accordingly, the combination of the two main drivers (SMP and vertical integration) results in three scenarios which are likely to be of particular relevance:

- SMP and vertical integration;
- SMP but no vertical integration; and
- No SMP and providers could either be vertically integrated or not.

(214) In this chapter we consider some illustrative examples in which we apply the analytical framework presented above. The purpose is not to provide definitive answers – these can only be reached in specific cases and examining the evidence available – but to try to identify what are likely to be the key elements of any

competition analysis. Set out below are three general cases of potential differentiation practices which we use to explore the application of the three scenarios (a)-(c) above. These three examples of potential differentiation practices are discussed only in very general terms and there would be a need to take into account the specific market circumstances if one sought to apply these examples to a specific Member State:

- VoIP blocking on mobile;
- P2P blocking on fixed broadband;
- Differentiation in the conveyance of traffic of CAPs (quality and/or price).

(215) According to the data gathered by BEREC, most of ISPs offer Internet access with no application-specific restrictions. But specific practices (like blocking or throttling of peer to peer traffic or VoIP) more often occur in mobile network than in fixed network sector[30].

- Blocking/throttling of P2P traffic is the most frequently reported differentiation practice in the mobile networks. While 58% are not affected by such restrictions, at least 36% of mobile broadband users are affected by P2P related restrictions. The data is not clear enough to enable reliable conclusions to be drawn about the remaining 6% of users who might or might not face such restrictions. These P2P related restrictions are applied by 35% of mobile operators: 25% for their all end-users, 10% for some of them.
- VoIP Blocking or throttling has also been reported. While 61% do not face such restrictions, at least 21% of mobile broadband users are affected by VoIP blocking/throttling. The data is not clear enough to enable reliable conclusions to be drawn about the remaining 18% who might or might not face such restrictions. The VoIP related restrictions are implemented by 23% of mobile operators, either to all their end users (3% of providers) or to a part of them (20% of providers).
- On fixed networks, while at least 72% are not affected by those restrictions, at least 21% of broadband users are affected by P2P related restrictions. This corresponds to 18% of fixed operators: 15% for all their end-users, 3% for some of them.
- Finally, the differentiation among CAPs has also been included in the analysis as it is one of the elements that have caused most debate. While 75% of mobile broadband users do not face such restrictions, at least 15% are concerned by measures giving preferential treatment to specific over-the-top traffic. The data is not clear enough to enable reliable conclusions to be drawn about the remaining 10% who might or might not face such measures. For fixed networks, only 2% of broadband users face such measures, whereas 97% are not affected with 1% being unclear. Broadband users in Europe are not facing significant restrictions targeting specific providers (2% of mobile ISPs are concerned, none of fixed ISPs).

[30] For details and explanation on how the data are to be interpreted, the reader is referred to the BEREC document "A view of traffic management and other practices resulting in restriction to the open Internet in Europe" BoR (12) 30. Restrictions may either be enforced technically and contractually or contractually only. Also some ISPs apply restrictions to all users, while some apply it to some users only. Often the data on the number of users affected were not fully provided.

5.1 VoIP blocking on mobile networks

5.1.1 Service characterisation

(216) The use of VoIP on mobile networks requires the availability, by the end-user, of Internet access provided by a MNO or a MVNO, of certain handset devices (i.e. smartphones and dongles), equipped with specific applications (software). The bandwidth required for a VoIP call depends on the codec used, ranging from a minimum of about 16 kbps to 80 kbps (approximately the equivalent of the capacity needed to download a standard web page) compared to around 12 kbps required to route the traditional voice call. Delay and jitter are other key parameters for the QoS of mobile VoIP.

(217) The complete migration to all-IP model (i.e. all customers using VoIP) would require a significant increase in network capacity compared to traditional voice calls. However, compared to the available bandwidth of mobile Internet access, the additional capacity used for VoIP services would not be significant. For example, the transformation of calls currently routed by traditional circuit switched techniques into mobile VoIP calls would require an increase in capacity (and therefore network investments). However, i) each year billions of minutes are already handled by MNO/MVNO and although a VoIP call on mobile network, as already mentioned, requires an increase in capacity of around 25% - 35% compared to an equivalent traditional voice call, many network operators have already undertaken investment on this scale in order to allow the provision of Internet access services on their networks.

(218) Mobile VoIP services can be provided either directly by ISPs (typically using IMS, IP Multimedia Subsystem) or by independent firms specialised in providing over-the-top applications. The former case represents VoIP provided as a specialized service (or “managed” VoIP service, as it often goes along with some form of management of the voice traffic made easier by the fact that the voice provider is in control of the network); the second case represents VoIP provided as an application on the Internet.

5.1.2 The differentiation practice

(219) In this case we analyse the hypothetical situation in which a MNO or a MVNO blocks use of VoIP applications by its subscribers over their mobile Internet connection. The blocking relates to access VoIP applications provided through the Internet access service and does not involve restrictions of access to VoIP provided as specialized services which a mobile operator may deliver himself over an IP-based mobile network or its existing legacy network.

5.1.3 The relevant markets involved

(220) In this example, we assume that there are (at least) two economic markets involved. The first is in relation to the provision of mobile Internet access. The practice of VoIP blocking is considered a differentiation because it results in a restriction of the access to a category of mobile applications. We also assume that

this market can be distinguished from the relevant market for Internet access at fixed locations due to the specific mobile character of the service involved.[31]

(221) The second relevant type of market we consider is the market for mobile voice telephony. The practice of VoIP blocking affects the possibilities for VoIP providers to offer (potential) substitutes for mobile voice telephony services offered by MNOs or MVNOs.

(222) The assessment of the potential effects depends among other factors on whether VoIP applications are considered (potential) close substitutes for mobile voice telephony or not.

(223) In this regard, we may have two mutually exclusive situations. In one case, VoIP applications are (potential) close substitutes for mobile voice telephony. In other words, VoIP and circuit switched calls are in the same product market. Therefore, the effects of this differentiating behaviour are felt in the mobile voice telephony market.[32] Alternative, the mobile VoIP may not be considered substitutable with traditional voice services, for example given different prices, different voice quality perceived by end-users or different network conditions (i.e. data handover has a higher probability to be unsuccessful compared to voice handover; 3G network has less coverage compared to GSM network, etc.).

5.1.4 Scenario 1: VoIP blocking by vertically integrated mobile operator with SMP

(224) Since MNOs and MVNOs are all offering bundles of services (including voice telephony, SMS and increasingly Internet access), in the event that it was deemed that VoIP and circuit switched calls are close substitutes, we also assume that there is vertical integration between the markets for mobile Internet access and the market for mobile voice telephony.

(225) Given a finding of SMP, if the market is predominantly served through these types of bundles and unbundled supply does not play an important role, one could assume that the market position of a mobile network operator and/or an MVNO on the mobile voice market and the mobile Internet access market are broadly comparable. Thus, a mobile network operator with SMP on the mobile voice market could be deemed to have SMP on the mobile Internet access market, and vice versa.

(226) In this illustrative scenario we assume that only one mobile network operator (or MVNO) is blocking VoIP and that the operator has SMP in the mobile Internet access market[33].

(227) The motive for blocking access to VoIP on mobile networks is the protection of existing business. By blocking access to VoIP the MNO(s) protects its mobile call

[31] As noted before, we acknowledge that in certain circumstances mobile Internet access can act as a substitute for fixed Internet access from the perspective of fixed Internet.

[32] If they were is separate product markets there could be no foreclosure.

[33] It might also be the case that all mobile network operators are blocking VoIP. That situation could lead to the finding of collective SMP, subject to the fulfilment of the relevant burden of proof for a finding of collective dominance. At this stage we do not distinguish this as a separate scenario since the type of effects of collective blocking on competition, innovation and consumer welfare would be the same. The severity of these different effects however may differ (this is discussed later).

profits that would occur as a result of substitution of voice minutes on the GSM/3G network by calls through the VoIP applications.

(228) The effect of the practice is that entry of VoIP providers into the mobile voice markets is foreclosed and the end-user is harmed[34]. The effects on the end-user of a VoIP blocking practice by a vertically-integrated SMP operator are thus likely to be severe already from a static viewpoint, regardless of whether such practices may also have a chilling effect on dynamic aspects such as innovation.

(229) An efficiency enhancing justification would also appear unlikely in this case since – as suggested above - the use of VoIP applications over mobile Internet access connections requires only a tiny fraction of the network. It is therefore unlikely that the use of VoIP will lead to congestion on the mobile network, and hence congestion management is not likely to be in principle a justification for blocking.

(230) Blocking can also not be regarded as differentiation of offerings to end-users since – in the case at hand - the operator is not offering a choice between offerings with and offerings without VoIP access.

5.1.5 Scenario 2: VoIP blocking by a SMP mobile network operator that is not vertically integrated

(231) The incentive to block access to VoIP is likely to depend on whether the provider of mobile Internet access is also active on the market for mobile voice telephony and whether VoIP is considered a substitute for mobile voice telephony. In the case where the provider of mobile Internet access is not active on the voice market, or in the event that VoIP applications are not considered close substitutes for circuit switched calls, there is less likely to be vertical integration. This significantly reduces the incentive to block VoIP, and thus reduces the above-mentioned concerns of potential foreclosure in the voice markets.

(232) Nevertheless, a MNO that is not vertically integrated and with SMP in the mobile Internet access market may still have an incentive and the ability to charge excessive prices, even in the absence of any foreclosure effects. As Internet connectivity is an input for the provision of VoIP applications, a MNO having SMP (and that does not provide voice services itself) may charge excessive prices to either VoIP providers or VoIP end-users, although this behaviour needs further analysis in the mobile market environment.

(233) In fact, the excessive charging practice may take two forms: i) disproportionate price or ii) infinite price (that is, blocking or no provision). In this context, VoIP blocking, which can be seen as an (extreme) excessive price, implies that the SMP operator does not extract rent from the VoIP provider (VoIP end-user), as no revenues are derived from blocking itself. Then the presence of VoIP blocking would rather be evidence for substitution (from the supply side point of view) between VoIP and traditional voice services (in order to protect traditional voice call revenues).

(234) With regard to the disproportionate price case (that is disproportionate pricing to VoIP consumer or VoIP providers), it can be observed that this practice is not straightforward in the current Internet ecosystem where, generally speaking, no

[34] In case of collective blocking this effect may be deemed to be stronger than in the case of individual SMP.

transactions occur at present between the VoIP provider and the MNO, and the Internet access market does not generally experience *ad hoc* prices for specific services[35].

5.1.6 Scenario 3: VoIP blocking by mobile network operator without SMP

(235) If no SMP is found on the market for voice telephony and mobile Internet access, it is unlikely that the VoIP blocking practice by one operator on its own will have a negative effect on the level of competition in the market and on the choices, price and quality provided to end-users. This is the case especially when – as outlined several times by the Commission and BEREC – offer conditions are transparently published by operators and switching operator procedures are effective.

(236) It is also unlikely that the practice negatively affects innovation in this scenario, because in the absence of SMP there are enough alternative providers of mobile Internet access who compete for the provision of access to innovative applications. This is the case whether or not VoIP is part of the mobile voice market, that is either with or without vertical integration by (some) operators.

(237) Nevertheless, there may still be some competition concerns. The main competition concern is that if mobile VoIP blocking becomes widespread (that is, VoIP is blocked by many commercial offers of one or more Internet access providers) then a large amount of end-users will face reduced choice, and less innovation.

(238) In this case, the VoIP providers would complain that such practices discourage, broadly speaking, the introduction of new voice applications (or the upgrade of existing VoIP applications), to the detriment of end-users and social welfare.

(239) In fact, when VoIP blocking becomes widespread, the impact of these practices would be amplified and end users with internet mobile access would not have the possibility, even with switching, to make or receive call through VoIP providers.

(240) MNOs could argue that testing new forms of pricing meets practical needs and is necessary for a business case for broadband and ultra-high-speed networks. In mobile services, to date, the total remuneration was carried out through a model based on the service offered, i.e. based on total revenues derived from voice traffic, by SMS/MMS and, indeed, from Internet access. In such a context, characterized by the development of over-the-top mobile VoIP applications, the pricing model for services (and therefore the current business model) could not guarantee the economic sustainability of the offers, requesting a rescheduling in order to face revenue erosion on legacy voice, needed *inter alia* to allow the further take up of VoIP applications.

[35] The pricing structure set by ISPs is usually based on a (flat) tariff where an end-user pays a specific amount of money for a pre-determined number of hours or data, there being in general no differentiation on whether the data is actually used for mailing, browsing, VoIP, etc. Exceptions may however apply, e.g. an operator requiring a specific payment for the provision of specific services such as VoIP.

5.1.7 Conclusion

(241) VoIP blocking is mainly motivated by the protection of existing business for vertically integrated operators, who offer both voice services and internet access services. If this operator has a dominant position on the voice and/or internet access retail market, the blocking has strong effects on end users, who have their choice limited, and VoIP providers, who cannot enter the market. Innovation is likely to be affected in the long term.

(242) If the operator has no SMP, the availability of non-blocked offers in a competitive market where transparency and easy switching are effective reduces the negative impact of blocking. However, if blocking is implemented by several mobile access providers and becomes widespread, its impact is amplified on both end users and VoIP providers.

(243) The unblocking of VoIP may require that mobile operators rebalance their revenues between voice services and internet access. This evolution helps operators maintain sustainable business models, while promoting innovation for over-the-top Internet applications.

5.2 P2P blocking on fixed broadband

5.2.1 Service characterisation

(244) To analyse the impact of P2P blocking on competitive conditions of markets and on stakeholders it is necessary to focus on the application used by the P2P system. This concentration on a special application simplifies the understanding of market effects as it allows concentration on a single specific market.

(245) For a more detailed understanding of this complex topic, reference is made to the technical description of P2P systems included as an Annex to this report.

(246) For illustrative purposes the case of Video on Demand (VoD) services distributed via the content distribution network BitTorrent[36] is looked at here (rather than software upload, volunteer computing etc.), as VoD produces high capacity demands. Therefore the ECP may have an incentive to prevent his end-users from utilising VoD services by blocking this P2P-system.

5.2.2 The relevant markets involved

(247) Given that a P2P file distributing system like BitTorrent is blocked (and this has occurred on some occasions) several markets could be involved. Firstly the Internet access market[37] is involved, as P2P systems are based on the TCP/IP protocol suite of the transport network and end-users need to be interconnected via an Internet access for using P2P applications. The ECP may be tempted to manipulate

[36] Distributing VoD services via file sharing bulk data distribution application is rather new practices see, for instance, BBC's iPlayer. Traditionally VoD services are delivered as a unicast connection via using a streaming protocol.

[37] Actual broadband access lines and Internet access services are always marketed as bundles and the great majority of those two products in the market are bundles. Without anticipating any detailed market analysis broadband access and internet access are integrated here in the Internet access market.

the end-users' access line for instance via port blocking or via analysing the traffic by the help of deep packet inspection to detect specific software (e.g. BitTorrent software).

(248) Blocking traffic of P2P systems used for sharing and distributing files is considered a differentiation since it results in a restriction of the Internet access service to a category of traffic generated by specific applications. Therefore here we assume that the behaviour of differentiation via blocking takes place at the relevant market on Internet access market.

(249) Since the early days of Internet content and application services have been provided separate from underlying transport and access services. A lot of content and application services (e. g. VoIP services, video on demand services) still predominantly seem to be provided in that manner. Only the increased use of DPI etc. allows access providers to differentiate between applications, e.g. blocking P2P applications.

(250) Secondly depending on the application used by the help of the BitTorrent P2P system different content and application markets are involved. This could for instance be a content market providing video on demand services or an IT application market providing software via P2P systems. The practice affects the possibilities of CAPs to offer their content and applications in an efficient way or via an alternative distribution channel that compete against the service offer of the ECP.

5.2.3 The differentiation practice

(251) The popularity of P2P applications is causing not only significant concern for the owners of copyrighted material but also for ECPs by creating network capacity and subscriber management problems. With P2P applications users share files and a typical peer serves megabytes of files, causing a shift in the upstream/downstream ratio. Congestion results on the upstream link due to a larger number of subscribers using the upstream link. Also applications like home working and video conferencing have a similar effect. However, this is a general trend that is observed for modern Internet applications, often referred to as Web 2.0, where consumers increasingly produce content and not only consume content any more. It is therefore a natural change from asymmetric to symmetric access capacity need.

(252) The Internet pricing model originated at a time when client-server applications dominated the traffic on the Internet. Commercial server operators pay their ISPs for the bandwidth used, who in turn pay their respective providers. Since residential customers rarely operate servers, it was reasonable to assume they generate little upstream traffic, keeping costs low for local ECPs and enabling them to offer flat-rate-priced services. It is argued that P2P content distribution applications might incur traffic transportation costs that the ECP cannot pass on to his flat-rate customers. Residential customers are uploading much more traffic than it was originally calculated in the ECP's flat rate but this could instead result in recalculation of the rates or introduction of alternative traffic profiles.

(253) The basic challenge is however the total traffic growth and not the P2P application per se. The P2P traffic could, like for example ordinary streaming traffic, create congestion so the ECP might be forced to increase its network capacity to avoid decreasing performance for all his end-users.

(254) There might be a more efficient and less distortive way to achieve the same result: Upstream capacity could be limited in an application agnostic manner. This would be a more relevant way to deal with the problem, inducing fewer side effects.

5.2.4 Scenario 1: P2P blocking by a vertically integrated ECP with SMP

(255) The ECP offering Internet access services may be integrated, in the sense sketched in chapter 4.3.1., providing also Video on Demand, IPTV services etc.. This is especially the case if those ECPs are (fixed) network operators running own broadband networks offering retail and wholesale products[38].

(256) It is not always possible to decide in general whether bundles offered by vertical integrated providers lead to vertically integrated markets (with adjusted competitive conditions) because other players in the market could offer components of the bundle separately. One can doubt that the services like VoIP or content and application services are predominantly provided over those bundles. As long as unbundled services are of importance (which is the case in connection with VoIP offers or Video on demand providers) vertical integrated providers don't predominate the market. In this case, competitive conditions at content market differ to those at the Internet access market. The content and application services being subject of differentiation by blocking P2P are no substitutes of the Internet access market where it could be the case that ECP has SMP.

(257) The assessment of the potential competitive effects depends on the degree of vertical integration of the ECP and on the application (here VoD services) used by this P2P system. For the finding of significant market power (SMP) one has to analyze the situation on the relevant markets involved.

(258) Assumed that a vertical integrated operator has SMP on the Internet access market it has to be checked if it has SMP at the relevant content and application market too. At content and application markets (in our example VoD services) there seem to be more providers having specialised in unbundled supply of content and applications services, e.g. VoD services. So the competitive situation of these markets may differ to the one of the upstream markets. At first sight, it is unlikely that the ECP having SMP on the Internet access market also has SMP on one of the content and application markets.

(259) In the case we look at only a vertically integrated ECP with SMP at the Internet access market is blocking a special P2P system. ECPs see P2P systems critically because some ECPs view many of the currently deployed P2P applications as competing with their own specialized services. (VoIP-, IPTV-, VoD-applications). In either case, P2P-systems might potentially diminish such ECP's market share in the more profitable specialized services in favour of conveying traffic which doesn't attract extra revenues. Saving network costs might also be a motivation for blocking here, but this case is discussed under scenario 2. We consider the blocked system is a P2P file sharing bulk data distribution system (e.g. BitTorrent) especially used by end-users to distribute VoD files. This practice does not directly affect the competitive situation on access markets, because the blocked application hampers the service at the downstream market (content market for video services). The products of this downstream content market are no substitutes of the products on the Internet access market. The practice might have a competitive effect on the content market, if it applies only to certain type of contents.

[38] If the ISP is also a provider of wholesale products e. g Bitstream he also can block the Bitstream based access lines of alternative competitors' end-users.

(260) Therefore as the ECP has no market power on this content market this practice may not directly lead to foreclosure in the downstream (VoD) market, although in reducing consumer choice he may strengthen his position at the VoD market. Market entry barriers may also increase for independent VoD providers using P2P. He also affects the end-users at the Internet access market, as they are harmed by higher charges in using VoD services in a less effective respective cost saving manner. In so far depending on his market position at the content and application market, e. g. VoD market, the ECP may be able to leverage market power to this downstream market.

(261) At the other side the incentives of this practice are relatively low (potentially strengthening his competitive position at the VoD service market) compared to the disadvantage of blocking additional applications (relying on P2P system) too which affects the end costumers' convenience and choice in a substantial manner. Attempts by the ECP to limit access to Internet content by P2P blocking would likely result in the loss of subscribers that prefer unrestricted access. This provides a competitive constraint that limits incentives for such actions. The ECP even if he is SMP-provider faces disincentives for restricting access to Internet content. In so far there are some indirect effects potentially affecting the ECP's market power at the access markets. Bearing this in mind hampering access to VoD services by blocking P2P systems does not seem to be a realistic scenario for a vertical integrated fixed network provider. This might be the reason why those practices up to now rarely are applied by vertically integrated fixed network providers[39]. If blocking needs to be made transparent this may further discourage ECP from applying this practice.

5.2.5 Scenario 2: P2P Blocking by a ECP with SMP without vertical integration

(262) If the ECP is offering only broadband access lines without any additional downstream specialized services, and so is not vertically integrated, there might still be an incentive to hamper VoD services in blocking P2P systems: in this case his motivation for blocking is not to protect his business model by offering own specialized services. The motivation of a non-vertically integrated provider having SMP at the access markets might be to prevent network congestion and reduce transportation cost. This is especially the case for an ECP running a mobile network which is very cost-sensitive for high capacity needs. Another motivation could be given by the extraction of extra profit from the contents' side.

(263) Furthermore, this practice of blocking a special P2P application (or practicing excessive pricing that ends up with the same effect) keeps the ECP's end-users off addressing capacity intensive services; however other capacity intensive traffic like e.g. Youtube is not affected. It is evident that P2P blocking prevents the end-user from using services which are no substitutes of the products of the Internet access market. This practice does not directly affect the competitive situation on access markets, because the blocked application hampers the service at the downstream market (content market for video services). The products of this downstream content market are no substitutes of the products on the access markets.

(264) As the ECP is not active on this content market this practice may not directly affect competitive conditions at the downstream (VoD) market, but in reducing

[39] See results of BEREC Traffic Management Inspection

consumer choice and access to this content, barriers to market entry may increase. The ECP even if he is SMP-provider faces disincentives for restricting access to Internet content as a significant number of end-users would not accept this restriction and change the ECP. The ECP has to consider the trade-off between reducing his network cost and congestion problems by limiting his end-users' access to Internet content via P2P blocking and the loss of those end-users that prefer unrestricted access: withholding a SMP, this practice is unlikely to be unprofitable. In so far there are some indirect effects potentially affecting the ECP's market power at the access markets.

(265) Besides those short term effects there are long term effects which seem to be more crucial. P2P systems like BitTorrent enable fast efficient distribution of large files by leveraging the upload bandwidth of the downloading peers. These systems dramatically reduce the server loading and provide a platform for scalable content distribution as long as there is interest for the content. P2P systems are organized in a way that they allow the creation of decentralized, dynamic, and anonymous logic networks. They are efficient in the management of bulk traffic and thus help saving cost. P2P enhancements like P4P and ALTO also provides techniques that takes the network topology into account when selecting peers, which further decreases the traffic load of the IP network. The peers work as distributed caching servers eliminating multiple downloads of frequently requested content over long distance links. Low entry barriers in connection with low costs attract niche products which promotes investment and innovation. Taking into account that the current uses of P2P systems are not any more restricted to content distribution via file-sharing - they include also software distribution, scientific computing and telephony services and so on - blocking P2P systems has in the long run considerable negative effects on innovation which weakens the competitiveness of Internet economy overall (this effect applies also to scenario 1 and, as long as the blocking practice is widespread in the market, to scenario 3).

(266) It might also be the case that all ECPs present in the access markets are blocking traffic of special P2P applications. That situation might be considered as collective SMP which is difficult to prove. At this stage this is not treated as a separate scenario since the type of effects of collective blocking on competition, innovation and consumer welfare would be basically the same. The degree of these different effects could differ.

(267) It is likely that those strategies may be successful in the short term but in the long run ISPs probably benefit directly and indirectly from the innovation and emergence of new services that P2P systems might enable. Perhaps ISPs may find new revenue sources by offering infrastructure support for successful services that initially develop as P2P applications.

(268) In blocking P2P systems or special applications it reduces consumer's choice, restraints his efficient access to capacity intensive and innovative applications and shields the end-user from innovation. Thus reduces the consumer's welfare, statically and dynamically.

(269) In acknowledging ECP's interest to convey traffic with covered costs changing the pricing model might be a solution which is less harmful for consumer's welfare. Operators that control several service categories like voice, video and Internet access, can adjust the tariffs of individual services in order to maintain profitability.

(270) The competitive effects at the broadband access market and the effects on consumer welfare are the same as pointed out in the case of vertical integration. Also here would occur the harmful effect of the practice for end-users that the use

of innovative applications is restrained to a certain extent. In case of collective blocking this effect is stronger than in case of individual SMP.

(271) The effects at the downstream markets are different in comparison to scenario 1, as the ECP is not active there. So there is no leveraging of market power. This practice could affect competition on downstream markets as it may reduce demand at content and applications markets, diminishing scale effects with all negative impact on innovation, market entry barriers and others. Moreover, it may affect end user with excessive prices for video services.

(272) The selection of some specific application (such as a P2P application) for restriction also raises net neutrality questions for NRAs in situations where blanket (and non-selective) capacity limitations ("CAPs" could adequately protect the ECP from congestion problems. A blanket cap has the advantage of targeting excessive users, rather than individual applications that affect all users.

5.2.6 Scenario 3: P2P Blocking by an ECP without SMP

(273) As stated above blocking P2P systems in hindering end-users' access to VoD services does not affect competition at Internet access market. The relevant applications which might be concerned by the blocking are not substitutable with the products of the access markets. Though no SMP is found on the market the ECP might have an incentive to block a P2P system. These are the same reasons described in scenario 2. The ECP blocks because he wants to prevent traffic congestion, save costs. In case he also offers specialized services at the content and application markets – as an additional motivation – he wants to prevent his offers at content and application market from cannibalising. Thus he reduces also the choices and the quality provided to end-users.

(274) This practice very rarely affects innovation negatively, because in the absence of SMP there are enough alternative providers with non-blocked access services who compete on the provision of access to innovative applications. This assumes that: 1) there is enough transparency so that the end users is informed of the restriction and is aware of his precise needs; 2) the end user is able to find unrestricted offers.

(275) This assessment differs in case a significant number of providers act in the same way, although no SMP can be identified. In that case blocking of P2P systems might have in the short and long run considerable negative effects on end-users and innovation, if the following parameters are fulfilled:

- The providers, which decided to block, are important providers on the market and their number is significant,
- There are market entry barriers, so new firms don't enter the market,
- End-users' interest in using this feature is low, or insufficiently high in order to compensate for the unavoidable hassle of ECP switching (identifying preferable ECP as regards what remain second rank characteristics of an offer, ordering the ECP change, possible interruption of service for the switching, increased risk of access failure after the switch, etc.),
- ECPs' blocking behaviour is rather intransparently,
- Impact of the practice is hard to understand, and not directly related to one specific and delimited usage,
- Non blocking competitors are not that attractive that blocking ECPs rarely risk losing a significant number of end-users.

(276) In a competitive market those conditions seldom can be found cumulative. Therefore there are doubts whether this strategy is successful for non SMP providers, as they typically face significant competition and a wide range of firms are entering. Given these alternatives, access providers that fail to satisfy end-users' preferences in having access to P2P-services risk losing substantial numbers of subscribers to competing access providers. These circumstances limit the risk that broadband access providers attempt to engage in discrimination.

5.2.7 Conclusion

(277) There are a few situations where ECPs might see justification for the practice of blocking P2P applications, especially when the ECP finds strong evidence of congestion or if it bears high variable costs for traffic (of more relevance on mobile markets). However, even in those situations powerful arguments should be provided for any differentiated treatment as application-agnostic traffic management could also be used to cope with these situations.

(278) Vertically-integrated ECPs may also aim at degrading their competitors' contents or applications which are distributed through P2P. This blocking affects competition in the downstream market (the relevant content market) strengthening his market-position in reducing consumer's choice might and can deter innovation if the operator holds SMP on the Internet access market.

(279) SMP ECPs, not active in the relevant content market (that is not vertically integrated) may have the incentive to block peer to peer application for technical reason (again congestion).

(280) The reduction of end-users' choice in restricting their access to services lowers the attractiveness of ECPs at the end-user market. Therefore there are good reasons to believe this form of differentiation will not be a successful strategy, in cases where broadband access and Internet access markets face competition. This applies specifically if providers have to declare transparently their practices regarding the restriction of traffic and the blocking of content[40].

(281) However, if this practice became widespread, what is not the case yet it would cause significant concern, by having short term impact on end users and sending long-term negative signals to providers of innovative applications based on P2P.

5.3 Differentiation of services to CAPs

(282) Finally we deal with one of the practices that have created most debate though the practical relevance as empirical data[41] show is currently relatively low: a differentiation by ECPs of traffic delivery conditions offered to specific CAPs. In general, as stated above, ECPs have until now not charged CAPs, mainly because of the "*no commercial-relation practice*" and because ECPs mainly bought their upstream connectivity (as transit) or exchanged it between peers. However, ECPs could try to negotiate with some CAPs.

(283) This practice could imply:

[40] See Art. 20 (2), lit.b, Universal Service Directive
[41] See result of BEREC traffic management inspection

- a positive differentiation: the offer of a “premium” service compared to the current best effort delivery (e.g. prioritized handling of live video; out-of-cap data delivery)
- or a negative differentiation: a degradation of delivery (e.g. lower priority) to push CAPs to the paid service, to lower ECP’s production costs or to hinder a competitor’s service – this hypothetical situation, when it negatively affects a large number of content providers, is referred to in the net neutrality literature as the “dirt road”.

(284) Impacts on end users and CAPs depend heavily on the nature of differentiation and on the transaction costs as well as on the willingness to pay. In particular, positive differentiations may be similar to specialized services, which do not necessarily raise competition problems, as long as they leave enough quality for the best effort delivery of traffic. They could possibly raise issues about undue discrimination.

(285) Effects also depend on the balance of power between CAPs and ECPs. An ECP which holds a dominant position on its retail market is likely to impose significant negative impacts on its end users if it throttles some contents, while it may also gain bargaining power towards CAPs.

(286) The likelihood of a “two-speed Internet” is largely unclear today, as most contents and applications benefit from a best-effort delivery on ECPs’ networks. The management of quality of service is mainly dealt with at interconnection level, through relationships between CAPs, transit providers, CDNs and ECPs.

(287) In this section, we analyse the situation where CAPs and ECPs directly interact to set how CAP’s traffic will be handled on ECP’s network. We apply the framework analysis to this case as we have done in the other practices analysed. An important question lies in the ECP’s market power.

(288) Firstly the ECPs are providing delivery data services, either directly or indirectly, to the CAPs as described in section 4.1.4. An SMP ECP has the ability to behave as price-maker (and quality maker) with respect to any CAP, he is commercially related to;

(289) On the other hand, countervailing buyer power from larger CAPs could also be very relevant in the ability of the ECP to behave independently. If the CAP is a well-known brand in Internet, therefore, the end users will demand a proper access to its contents (for example, Google, Facebook, etc.). If the end users are aware of differentiation practices in a concrete ECP, they will choose those ECPs where these practices are not present. If the CAP is small, its contents normally will be aggregated by transit operators which bring together the traffic of several CAPs. In this case, although the CAP by itself will not have a high power, the transit operator could handle wield some power vis a vis the ECP.

5.3.1 Data delivery differentiation by a vertically integrated ECP with SMP

(290) In the first scenario we deal with a vertically integrated ECP with SMP on a broadband retail market, which differentiates practices in the delivery of data coming from one or several CAPs. Vertical integration has to be widened beyond cases where the ECP is active at different steps of the value added chain but also to cases where the ECP has reached an agreement with a CAP such as, for example, exclusivity or a revenue sharing agreement.

(291) A vertically integrated ECP has incentives to discriminate traffic coming from CAPs which provide contents or applications competing with its subsidiary. End

users face negative effects, as they have their choices diminished and see the quality of other services deteriorating. They cannot easily send signals to their ECP which holds market power on the retail market. Competing CAPs, if they cannot benefit from the same conditions of delivery in fair conditions, are also heavily affected. Possibly, they are even unable to negotiate with the ECP which holds SMP and unilaterally decides how to differentially handle traffic. This practice causes high transaction costs as there are no direct commercial relationships. There are only indirect ones via HCPs and intermediaries. Given the small amount of unit costs of an Internet service, those transaction costs could represent a significant part of overall service cost. So those service cost might have negative impact on innovations.

(292) If the ECP only positively differentiates its own content's delivery, effects are more limited. However, other CAPs may be unable to have their services handled in comparable conditions if the ECP offers no mutually acceptable conditions for such an improved delivery. This affects end-user value especially in using content products which are delay sensitive. In particular, the ECP might find leverage in its SMP on retail market to dictate delivery conditions to CAPs. This could raise questions about undue discrimination.

5.3.2 Data delivery differentiation by a non-vertically integrated ECP with SMP

(293) This scenario covers the case of non-integrated ECP with SMP. In this case, the incentives of differentiation involve the income maximization and/or minimizing ECP's costs, imposing a positive price to CAPs for the delivery data service or differentiating their traffic in a negative manner.

(294) The SMP provider on the broadband retail market possibly gives the ECP a higher influence towards CAPs, as its customers cannot easily switch to competitors. The service they enjoy has its quality largely dictated by the ECP which behaves independently from competitors. This power on the retail market tends to affect CAPs: negative differentiations or restrictive positive practices could discriminate content providers, with no possibility for them to rely on end user's demand as an opposing force.

5.3.3 Data delivery differentiation by an ECP without SMP

(295) This situation differs from the previous ones by the fact that a non-SMP ECP is supposed to pay more attention to its competitors on the retail market. In these conditions, a negative differentiation against one or several CAPs is less likely, as customers would tend to switch to other ECPs.

(296) For a vertically-integrated ECP, a positive differentiation for its own content is very similar to a specialized service. As long as this practice does not affect the quality of other services provided on the internet, it is not detrimental to end users but may affect CAPs which do not benefit from it.

(297) The non-vertically integrated ECP could also decide to move from the *"no commercial relation practice"* and opt to demand a positive price for the delivery data service to CAPs, or lower their quality. This situation requires extensive efforts from the ECP, which faces competition on the retail market and could see its end users leaving it if CAPs decide not to pay the required price and suffer from a lower

quality of delivery. Market imperfections and lack of transparency however give space for such initiatives.

(298) The same ECP could also offer a higher quality to CAPs at a certain price. As explained earlier, according to the two sided market theory, charging CAPs is not necessary inefficient. If this practice is non-discriminatorily open to all contents, it could be argued that it could have a positive effect for both CAPs and end users. However, it could also create entry barriers for innovators and application providers which are eager to have their products and services easily available worldwide, but face high entry costs to access the platform in good conditions.

(299) The efficiency of this price increase in the delivery traffic service will depend on the competitive situation in the retail markets, because if they are not effectively competitive, the incomes gained in the CAP side will not be passed through to the end users.

(300) Regarding potential effects of this practice, obviously they depend on the manner differentiation takes place. If best effort services are generally degraded, the effects could be much higher that if the ECPs are offering new delivery services while maintaining a minimum quality best effort delivery service. However, if end users are aware of the quality offered by its ECP, and the retail market is competitive, even in this last case, the final result could possibly be efficient.

5.3.4 Conclusions

(301) Internet openness has produced impressive results which could be challenged if current conditions are changed. However, it could also be the case that the current model is not optimal in the long run with increasing costs that could discourage current and potential agents to enter in the market, diminishing future demand for CAPs. Moreover, innovation is also possible in the ECPs' side mainly by increasing investments in networks.

(302) Negative differentiation seems to be unlikely in a competitive market. That is the reason why this practice seldom occurs up to now. Nevertheless, should it happen, negative differentiation would raise serious concerns.

(303) But beyond obvious effects on end users and CAPs, positive differentiated handling of traffic raises questions about discrimination between CAPs, as some of them may not be able to enjoy the same conditions of delivery as the favoured content, even if they are willing to. Positive differentiation should be open in fair conditions to all CAPs, and left at their choice, to prevent such risks. In this area, minimum QoS requirements could represent an appropriate tool in order to guarantee best effort access to internet for end-user

(304) The interconnection market makes this openness easier, as CAPs do not need to have direct relationships with ECPs. They both have the possibility to optimize their connectivity and enhance the quality of the service they offer, without involving specific bilateral negotiations.

(305) It is recommended that ECPs do not differentiate their handling of traffic by considering the provider it comes from. Should they perceive the need to operate differentiation, in order to prevent risks of discrimination, practices should be based on broad categories of traffic and involve objective criteria.

(306) The emergence of high entry cost for content and applications providers to have their services delivered by ECPs in good conditions, even if it is not likely today, could cause concern and should be analysed with attention.

6 Conclusions on the effects of differentiation policies on end users' welfare

6.1 Introduction

(307) In this document, BEREC has acknowledged the huge benefits that Internet connectivity has brought to modern economies in terms of end-users' access to information, innovation, new forms of sharing information, increasing overall economic efficiency, etc. This phenomenon has occurred in less than fifteen years, taking advantage of the network effects present in the provision of services over Internet. Connected customers' access every day to more and more content and applications which, on their side, encourage more customers to get connected.

(308) It is generally agreed that Internet's success is based on its openness and non-discrimination features. The tremendous success of the Internet also related to the fact that both ends of the networks carried the costs for accessing the network: end users pay for uploading and downloading data to the Internet and CAPs pay for hooking their servers onto the net: direction of payment flows has helped to prevent exploitation of a termination monopoly allowing to gain rents from behaving like a gate keeper, given that there has been sufficient competition at the retail level[42].

(309) Internet's success has also increased, on the one hand, the total amount of traffic managed by telecommunications operators. Moreover, available forecasts indicate a continuing increase of traffic both in fixed and mobile networks. On the other hand, "bandwidth hungry applications" and advanced services require from upgraded access networks, which demand investments from ISPs. This has however been the case since the origin of the Internet and the growth rates are declining as well as the costs per unit, so that the overall costs may develop moderately or even decline[43].

(310) In this situation, ECPs are or may in the near future undertake several practices that modify the current conditions of Internet, in particular changing the non-differentiated treatment of traffic. The final aims of these practices are diverse, from the fulfilment of legal requirements to congestion management or differentiation of the current services offer.

(311) In this document BEREC has provided a conceptual framework to analyse these practices, applying it to concrete examples. This analysis is based on the potential effects of the practices on end-users, either directly (through the impossibility to use some services) or indirectly (through, for example, a reduction in alternative choices).

(312) The proposed analysis includes:

[42] BOR (10) 24 Rev 1: BEREC Common Statement on NGN Future Charging Mechanisms/Long Term Termination Issues, May 2010

[43] Plum, The open internet – platform for growth, October 2011, P. 18, 42 f

- A description of ECPs' incentives to discriminate (basically based on revenue maximization through their vertical integration or cost minimization absent any vertical integration);
- The ECPs' ability to perform the discriminatory practices in a sustainable manner in front of possible end users reaction, which depends among others on their position in the market;
- Finally, acknowledging the particular features of the Internet "ecosystem", the dynamic and static effects of these practices are taken into account. As it has been said above, due to network effects of Internet, any restriction could create entry barriers either for end users or, in particular, to CAPs, reducing this virtuous circle and affecting future consumer welfare.

(313) The above framework has been applied to illustrative practices to test it and try to obtain more general lessons that could be applied in other situations that could arise in the future.

6.2 Criteria to assess effects of discrimination on end users in practice

(314) In our framework of analysis we have discussed, first of all, the probability of the described differentiation practices happening. ECPs know that their customers contract their connections to access contents and applications on the Internet. Therefore, limiting these possibilities could have effects on their profitability by reducing demand for Internet connections, either in general or for one particular ECP, who for instance might have earned a reputation for setting restrictions to certain content.

6.2.1 Vertical integration and foreclosure

(315) For this reason, it is important to understand the rationale behind differentiation practices. The clearest case is the vertically integrated ECPs. In this case, the ECP is providing services which compete with applications or contents on the Internet. Thus, it can deter this competition on the content and applications market by degrading or blocking these concrete applications. By doing so, the ECP reduces consumer choice and could maintain prevalent conditions on the service. The paradigmatic example of this is VoIP, where ECPs are providing voice calls through the traditional fixed or mobile network, while end-users could find substitutes on Internet (maybe no perfect substitutes but at least viable substitutes for some types of calls) at lower prices (even for free). This is also in part the case of VoD, analysed in the case related to P2P.

(316) As this differentiation has the aim of foreclosing, the effects on end-users are high because these practices have both static and dynamic effects. The lesser the competition, the higher the prices and in addition, restrictions on CAPs could have effects in the long run by limiting their growth by reducing their potential demand.

(317) In any case two additional elements should be taken into account when determining the effects of discrimination in the field of vertically integrated operators. On the one hand, the market power of the ECP who undertakes the practice. On the other, the intensity of the practice. These two elements are analysed below.

(318) In an effectively competitive market it is less probable that differentiation practices could be sustained in the long run, as if competitors identify that such applications are valuable for end-users, there would be an opportunity to gain market share by eliminating all restrictions imposed by the competitors. Indeed, this has happened in some Member States, where small operators did not block VoIP which, at the end of the day, forced bigger operators to also open this application on their networks. For this reason, in our framework for analysis, when differentiation practices are undertaken by non SMP operators, a degree of generalization of the practice is required to effectively reduce end-users' choice.

(319) For competition to be a disciplinary force some elements are needed. Firstly the end-users have to value the application or content enough to switch and thus, the ECP must face a competitive pressure by differentiation. Second, the market has to be transparent so the end-user is aware of the differentiation and can take decisions. Once the decision of moving from the current ECP is taken, the switching costs should be low.

(320) The second element raised is the intensity. The more restrictive the practice, the greater effects on end-users. For example, straight blocking is more intense and, therefore, more harmful than situations where, for example, a set of offers are in the marketplace and in some cases the application is blocked but in others not. In this case, end-users have still some options to escape from blocking, normally by paying a higher price. In this situation, a closer analysis is needed because if the ECP is giving the choice to the end-user, the final aim of the ECP could be fair. For example, in the case of VoIP, higher prices of a non-restricted Internet flat rate could be the result of subsidised data tariffs by voice prices, unsustainable if the ECP cannot grant certain incomes from voice. Once again, in this case, the more competitive the market is, the fewer the possibilities of unfair prices being charged by ECPs for the unrestricted tariff (aiming to disincentive its purchase). In general terms, in competitive markets, NRAs should probably not need to deal with the speed and the intensity of this tariff rebalancing between data and voice tariffs. On the contrary, in less competitive markets, this could limit the opportunity for more competition on the voice services.

(321) In conclusion, in the case of vertically integrated operators, blocking or degradation of competing applications or contents on the Internet could have a foreclosure rationality behind, which harms end-users by reducing current competition and future choices. The effects of these practices are assumed to be higher if the ECP has some degree of market power. On the other hand, these practices might not be sustainable in a transparent market with low switching costs because end-users could, by their behaviour, discipline ECPs.

6.2.2 Differentiation practices undertaken by non-vertically integrated operators

(322) In general terms, potential differentiation practices could affect content and applications that ECPs are not providing by themselves. In these cases, the rationality behind such practice is either cost reduction (understood in broad terms such as network costs, but also congestion management), or income increase. As it has been described above, until now the *"no commercial relation practice"* has been the general rule between CAPs and ECPs. However, ECPs could have the incentives to move away from this practice, and start charging CAPs, in order to increase the total income of their operations. This implies that transaction costs are lower than the potential increase in revenues.

(323) We have analysed the case of cost reductions in the case of P2P. We have acknowledged that ECPs should have the opportunity to, in a non-discriminatory

basis, manage their networks to increase efficiency, minimising the resources needed to provide the service and assuring the best deal to all end-users. It is important to note that congestion has some hidden costs that are difficult to measure, as it affects all end-users connected to the network.

(324) From a static point of view, a fair traffic management could have positive effects if the market is effectively competitive. In this case, cost savings would be passed on to end-users in a fair way because competitive pressure at retail level will force operators to reduce prices or increase quality. This result is not necessarily affected by the fact that all ECPs are performing the same restrictions because this parallel behaviour is probably not caused by a joint SMP position but because the underlying reasons (cost savings) are common to all of them. But the most important issue is that end-users will benefit from the practices as competition will assure the pass through.

(325) If there is an operator or operators that hold single or joint SMP[44], the final outcome is not so clear. Restrictions will be in place with a reduction in costs, but end-users might not benefit from it.

(326) These arguments are only valid if the restrictions are done in a non-discriminatory basis among all content and applications providers, and under objective criteria such as consumption of resources. In other cases, the rationality behind the ECPS' behaviour could be distortion of competition. In particular, it may be difficult to imagine why the traffic of some concrete CAP is limited whereas the traffic of others is not, if the only aim of the ECP is congestion management.

(327) As well as non-discriminatory, the practice should be efficient and proportionate to the relevant motivation, in order to minimize possible side effects. In some cases, alternative and less distortive practices achieving the same objectives could be preferable, in particular when they can be content and application agnostic.

(328) From a dynamic point of view, the analysis has several elements to be considered as there are also positive and negative effects that should be balanced with the ones described above. On the negative side, restrictions will prevent some end-users from using in an intensive way some applications, or even they will be blocked. This is for example the case of P2P in mobile networks. Although considering the whole market, the outcome could be positive in the short term because of the arguments noted above, the potential demand of some applications will be reduced. This could reduce future innovation and content diversity, limiting future end-users' choice.

(329) However, it has to be said that this analysis is not straightforward because the NRA has to balance on the one side current efficiency benefits derived from effective congestion management and costs' savings, and, on the other, future benefits and costs that are always uncertain.

(330) Differentiation can be motivated by cost savings, but also because ECPs want to increase the income obtained from the connectivity activities. In any event, complaints seem not to have been directly related to concrete CAPs but towards ISPs. The analysis in this case is even more difficult.

[44] As mentioned in section 4.3.1, while there may be a debate as to whether SMP is the appropriate market power threshold to identify concerns in the area of traffic delivery differentiation practices , we have taken this as a given for the purposes of this paper.

(331) On the one hand, moving from the "*no commercial relation practice*" should not necessarily reduce consumers' welfare. On the contrary, applying the two sided market theory, it can be even more efficient if the demand of end-users is now more inelastic than the CAPs one. However, this is difficult to assess as the CAP side is rather heterogeneous with big companies living together with small CAPs unable to directly connect to all ECPs. In this field, the big ISPs play an important role, aggregating traffic and reducing potentially high transaction costs that could arise if this practice is generalised.

(332) Moving from the *"no commercial relation practice"* raises another problem which is the price level set in the CAP side. As described in the market definition section, CAPs require ECPs to deliver their content to the end user, giving some power to the last ones to set the prices. However, a complete analysis is needed firstly to measure in an appropriate manner all forces engaged in this process, including the existence of countervailing buyer power from big Internet companies, or HCPs, which manage huge amounts of traffic from very different CAPs.

(333) Secondly, NRAs should also consider the sustainability of these restrictive practices as, probably, not all ECPs in the market will be able to move from the "*no commercial relation practice*" because of their small size compared to the agents listed above. The pressure faced by big ECPs from the smaller ones mirrors the discussion above where as it was seen small operators moved all ECPs – at least in some jurisdictions – to offer unrestricted access to VoIP. Competitive pressure from those ECPs unable to move from the current practices could prevent others to perform traffic management practices deemed to force CAPs to enter in direct commercial relationship.

(334) In the current situation it is therefore difficult to reach a final conclusion on the strength of the forces listed above and the efficiency of the potential final outcome. This will depend on the cost (transaction cost) and the final price level, if ECPs finally opt to move away from the "*no commercial relation practice*", and the generalization of the restrictions observed.

(335) Finally, it is important to bear in mind that this report, for the aim of clarity, has analysed restrictions of individual contents or applications. However, it could be that ECPs opt to restrict or block in broad terms the content accessible by end-users from their connections. In this case, the above conclusions might not be valid because the final outcome of taking together all restrictions is harming end-users by reducing the choice available from their connections. This could be especially problematic in an environment where ECPs tend to block or degrade applications or CAPs in a general basis, including when e.g. a particular ECP blocks a specific application or CAP, another ECP blocks a different application or CAP, and so on. In this context, Internet current features would be very difficult to maintain, this affecting end-users' welfare and potentially triggering the need to resort to the QoS provisions recently included in the Universal Service Directive.

6.2.3 Drivers to assess potential effects and available legal instruments

(336) One of the key elements considered is the level of competition observed at the retail level. In this context, NRAs have tools under the current framework to enhance competition and prevent the strengthening of SMP positions. These tools are available mainly at the wholesale level and are related to reduction of entry barriers.

(337) The other aspect that could affect the sustainability of restrictive practices is consumer awareness of such practices and their possibilities to exert pressure on the ECPs by their purchasing decisions. For this force to be effective a high degree of transparency (with understandable information for end-users) is needed. In addition, the possibility for end-users to switch in an easy, fast and cheap manner is also essential. Otherwise, end-users will not be able to exert sufficient pressure on ECPs and, in the same way, alternative ECPs will not see the unrestricted access as an advantage to compete in the market. BEREC has already been working regarding potential means to increase transparency in the market. However, it has to be acknowledged that these tools may not always be sufficient as Internet access is a complex product, and differentiation practices may play as second rank characteristics of the offers, not significant enough to trigger an end-user switching in front of switching costs that will never be zero, but nevertheless inducing significant side effects for end-users.

(338) Finally, when retail competition is not enough to grant an adequate output for end-users (which does not need to be exactly the same as the one observed today), NRAs have different ways to deal with specific behaviours of the ECP.

(339) First, if the operator has SMP, as noted throughout the report the main issues of concern may be foreclosure or exploitative pricing by the SMP operator. The current regulatory framework provides tools to assure that market power is not harming end-users thanks to the possibility of imposing ex ante obligations (it being noted in any event that under said framework remedies will usually have to be imposed at the wholesale level). Likewise, in the case of SMP players, application of ex post competition rules may also be possible (taking into account that the concepts of SMP and dominance should normally be aligned). The boundaries of the market definition exercise to be undertaken by regulators or competition authorities in order to prove the existence of SMP/dominance are in any case beyond the scope of this report.

(340) In addition, the revision of the existing Directives has granted additional tools to NRAs in the form of minimum quality requirements, which could – on the basis of the decision taken by the NRA considering the particular circumstances of the case – be also applied to operators having SMP in a given market. Application of the QoS provisions may be particularly relevant taking into account that the practices undertaken by the SMP operator/s could be those that have been deemed particularly detrimental for the development of competition, in particular in instances of foreclosure.

(341) On the other hand, resorting to QoS provisions might also be effective in a situation where discriminatory practices that do not have any legitimate objective and fair rationality become more frequent, even absent SMP[45]. In this case, end-users' connections may be degraded by such practices and future innovation might be discouraged. Imposing minimum quality requirements should only come after a thorough analysis of the practices and their situation in the context of a market, which are detailed in BEREC's *Guidelines for Quality of Service in the scope of Net Neutrality.*

[45] The mediation by NRAs in conflicts arising between electronic communications operators and CAPs may also be an option, on a case by case basis, when on the basis of national law NRAs have been granted the possibility to intervene to solve such cases via dispute settlement procedures.

ANNEX

P2P characterization

(342) There are two fundamental systems of network communication

- a client-server model and
- a P2P model (client to client).

(343) In the client server model a number of clients are connected to the network in order to access a central machine, a server. The network is designed to fulfil the communication needs. There are a number of organizational server units connected to the network where a lot of traffic is terminated/originated whereas the majority of network end-points (clients) generate a comparatively low amount of traffic.

(344) In a P2P model there is no hierarchical distinction between server and clients. All communication partners have equal rights, i.e. they are peers. A P2P program (software) installed on the end-user's computer is needed to construct a community of P2P application users. Thus it creates a virtual network between these users. Those individuals form a loose group and each member can communicate with another member without the control of a central instance (a server). They can e.g. share files from their local computers and download files shared by other users[46]. There are dozens of different P2P applications, and each one acts a little differently.

(345) In this section there will be a specific look at P2P systems which are the basis for specific P2P application.

(346) The music download system Napster[47] was one of the first services successfully using the P2P system.

(347) In the meantime P2P technology has gone far beyond music sharing, anonymous data storage, or scientific computing. It now is a matter of significant research attention and increasingly subject of widespread use in open software communities and industry alike. Scientists, companies, and open-software organizations use BitTorrent[48] to distribute bulk data such as software updates, data sets and media files to many nodes. Commercial software allows enterprises to distribute news and events to their employees and customers. Millions of people use specific services to make video and phone calls and hundreds of TV channels are available using live streaming applications.

(348) The most successful P2P systems are used for

- Sharing and distributing files
- Streaming media
- Telephony
- Volunteer computing

[46] The recent challenge of peer to peer systems for file sharing by services which offer users the ability to share files through centralized servers, without relying on an underlying p2p infrastructure are not directly addressed here as they just can be seen as another (client server) web service.

[47] Napster bases on the peer to peer principle, but the service used a central server for index-linked lists of music files on the end-users' PCs. It helped to recognise, where to find which sort of data. The real transfer of the file was managed peer to peer.

[48] Bharambe, Herley et al., Analyzing an Improving a BitTorrent Network's Performance Mechanisms; to find under http://www.cc.gatech.edu/~dovrolis/

(349) In the report, sharing and distributing of files are discussed as an example. Here most popular applications are file sharing protocols (e.g. eDonkey, end user organized content distribution with a content search component or e.g. BitTorrent bulk data distribution for a predefined set of content). File sharing allows users to share their files with other participants, who are able to search for keywords in the file names. Other users would then download any of the files in the query which originates directly from the peer that shared it. There are successors of Napster (Gnutella, Fast Track or its client applications like Kazaa) which unlike Napster are not organized in a centralized manner and are not operated in a single entity.

(350) The desire of reducing the download time for very large files led to the design of BitTorrent[49], which enables a large set of users to download bulk data (predefined) quickly and efficiently. In a P2P system like BitTorrent peers not only download content but also provide it to other peers. The system uses spare upload bandwidth of concurrent downloaders and peers who already have the complete file or parts of it to assist other downloaders in the system. Unlike end user organized filesharing applications, BitTorrent and other P2P content distribution networks do not include a search component. The search component is however provided either as separate systems or as combined distribution/search systems. Users downloading different content are unaware of each other, since they form separate “networks” (so-called swarms). The protocol is widely used for dissemination of data, software or media.

(351) Important parameters of a P2P system are a high degree of decentralisation, self-organisation, abundance and diversity of resource and multiple administrative domains. There are distinctive characteristics of P2P systems which determine their (economic) value[50]:

(352) The deployment costs are low because P2P systems require little or no dedicated infrastructure, because P2P systems are using resources of existing end-user hardware and end-user network connections. The upfront investment needed to deploy a P2P service tends to be low when compared to client-server systems. → low barrier to entry in special services markets

(353) Virtually decentralised network structure allows organic growth. The participating nodes contribute to the resources. As long as the end-user and its ISP provides sufficient infrastructure resources, a P2P system can grow almost arbitrarily without requiring “high-level” investments in infrastructure.

(354) There is resilience to faults and attacks in P2P systems, because there are few if any nodes that are critical to the system’s operation. To attack or shut down a P2P system, an attacker must either target a large proportion of the nodes simultaneously (attack of terminal equipment the application is running on) or he must target the traffic flows generated by the applications (attack within the network).

(355) If an ISP wants to block specific traffic irrespective whether it is client-server or P2P traffic a filtering function is needed[51]. This function is normally located at the service access point of the ISP. In order to block traffic each IP packet has to be investigated. Based on a set of criteria the packet is then dropped (or in case of

[49] For more information of the network performance mechanisms see above Bharambe et all.

[50] Rodrigues, Peter Druschel, Peer to Peer Systems in Communications of the ACM, No. 10 2010 to be found under http://cacm.acm.org/magazines/2010/10/99498-peer-to-peer-systems/fulltext

[51] The discussion below on filtering criteria can also be extended to other services, such as VoIP services.

traffic shaping queued). Filtering criteria are in principle based on the following kind of information:

- Destination and source IP address of the packet
- Protocol used as indicated by port number (by the application)
- Content data (payload) of the IP packet

(356) The first two filtering criteria (according to destination and source IP address of the packet' or used application protocol) are related to the investigation of so-called header information of the IP packet whereas the latter one involves in-depth inspection of the payload, i.e. deep packet inspection (DPI). Besides the fact that DPI requires a lot more processing resources at the node it is commonly seen as a critical means of filtering because privacy issues are involved. So in most cases filtering is performed only with respect to IP addresses and protocols used.

(357) Due to the nature of P2P traffic the easiest way to prevent the user from using a specific type of application (e.g. file sharing, VoIP) is to block the traffic based on the protocols typically used by these applications. These measures involve the detection of the so-called port number stored within an IP packet. The combination of the IP address and port number identifies the end-point of a communication. This end-point is application or process specific. By blocking traffic send to or received from this end-point the application cannot communicate anymore and thus is blocked.

In order to block an explicit application of a specific company additional information (e.g. destination address, traffic pattern, content) is normally required since the protocol used by this application may unknown in advance, dynamically changing and may also be used by other applications. Regarding P2P applications, the destination and source addresses are multiple and will usually be dynamic and unknown in advance. In these cases DPI is often involved.