LES ACTES DE L'ARCEP

RÉPUBLIQUE FRANÇAISE

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Report to Parliament and the Government on Net Neutrality

English Version

ARCEP
www.arcep.fr
Autorité de régulation des communications électroniques et des postes

Summary

The key question in the debate over "net neutrality" is how much control Internet stakeholders can rightly exert over the traffic. This implies examining operators' practices on their networks, as well as their relationships with some content and application providers. Can they block services, throttle certain applications, prioritise certain types of content? Or should they, on the contrary, adhere strictly to the principle of equal treatment, as imagined by the Internet's original designers? The question is also whether this principle is compatible with the sustained traffic growth on the networks, in particular mobile ones, and with the need to finance the resulting investments. Lastly, questions arise concerning the role of terminal manufacturers in the scope of net neutrality.

It should be noted that the debate on net neutrality, as well as ARCEP's analysis and recommendations, are focused on the technical and economic conditions of traffic conveyance on the Internet.

This report does not deal with the debate about the control of public authorities over contents sent, received or transmitted on the Internet, although this is an essential question in a democracy. It is sometimes confused with the debate on net neutrality, and exceeds the competence of an electronic communications regulator.

In September 2010, ARCEP published 10 proposals aiming to establish a long-term, neutral, high-quality equilibrium in the way the Internet operates, including tools to ensure this equilibrium is maintained. A number of members of Parliament have also worked on this issue. As requested by Parliament, this report presents an overview of the works that ARCEP is currently carrying out, and explores the technical and economic aspects of the debate.

- It would seem useful for public authorities to pay attention to the behaviour of all Internet stakeholders. Because the network plays a central role in this ecosystem, the actions that ARCEP takes, by virtue of its powers, chiefly concern the conditions of traffic conveyance and the relationships between operators, content providers and end users. This report therefore focuses above all on these two essential aspects of the net neutrality debate.
- Most of the operators' income comes from the sale of Internet access services, thanks to which users have access to content and applications which , regardless of their nature, are conveyed using the "best effort"

principle, with no guarantee of quality. In addition, operators offer specialised services, which include a controlled level of quality (e.g. television and video on demand (VoD) solutions marketed by Internet service providers (ISPs), as well as some business services). With the increase and concentration of traffic, and the deployment of new generation access networks (optical fibre, 4th generation mobile networks, etc.), operators need additional financing. If new revenue can be generated by new services – via specialised services in particular – operators are also trying to have content and application providers help finance the networks.

By exploring new models, market players in general, and operators in particular, are engaging in practices that are likely to affect the Internet ecosystem over the long term. Trends such as the vertical integration of certain undertakings can create risks of anti-competitive behaviour or a diminished capacity for innovation, for instance.

- To manage the increase in traffic, operators may seek to differentiate the way data is conveyed. This is what is referred to as traffic management, and can consist in throttling or blocking some content or giving higher priority to others. Under certain circumstances, such practices could violate the principle of net neutrality. In September 2010, ARCEP had recommended that traffic management practices which are used as exceptions to the general rule of not differentiating treatment between Internet traffic streams comply with five general criteria: relevance, proportionality, efficiency, transparency and non-discrimination.

  ARCEP has observed a decrease in the use of these practices, in particular thanks to competition, and especially on mobile networks where they were the most frequent. Nevertheless, certain current practices are still contrary to the framework proposed in 2010. ARCEP is therefore calling for the steady elimination of service blocking (VoIP, P2P) on mobile networks. If the market fails to make sufficient progress on its own, the Law gives ARCEP the powers needed to enforce its recommendations.

- Traffic management practices may be intended to improve the quality of service for certain content or certain users, which may degrade "best effort" delivery. This "premium offerings" scenario is particularly effective for an ISP if the quality of "best effort" services is low. So this needs to be monitored in order to prevent its degradation.

  At the end of 2012, ARCEP will adopt a decision – a draft version of which has been submitted to consultation in June 2012 – describing quality of service (QoS) indicators for fixed Internet access that will be measured and made public, as a complement to the existing monitoring of mobile networks. The first of these recurring measurements will be performed in 2013. While preventive in nature, this mechanism will allow the Authority to evaluate whether it is necessary to set minimum quality of service requirements.

- The economics of relationships between Internet companies is evolving rapidly. The way that links and financial streams are scaled can be a source of tension between market players who disagree over interconnection conditions. Also, trends such as the vertical integration of certain undertakings can create risks of anti-competitive behaviour or a diminished capacity for innovation, for instance.

  ARCEP believes that the trends observed in today's marketplace, such as monetising interconnection, do not require a strengthened regulatory framework. However ARCEP wants, thanks to the regular gathering of information (which was put into place by its Decision of 29 March 2012) and the monitoring of quality of Internet access service, to accurately keep track of these trends, analyse them and determine future actions accordingly.

- These actions serve to complete the Authority's overall approach whose purpose is to encourage the development of a competitive Internet access market. Although not always sufficient, competition and transparency are necessary conditions for encouraging the spread of high-quality offers that comply with the principle of net neutrality.

  The new European framework, which has now been transposed into French Law, specifies the objectives assigned to the regulator and to economic stakeholders, in order to uphold the principle of neutrality, in addition to giving the regulator increased responsibilities. These substantial provisions, completed by the proposals that ARCEP drafted in 2010, allow the Authority to move forward in the effective implementation of the principle of net neutrality.

It is under these circumstances that this report seeks to provide Parliament and the Government with a clear picture of the current state of affairs – where we find improvements but also risks of deterioration – and of the medium-term outlook. It is up to the legislator to assess what actions to take.

If Parliament should consider it useful to transcribe the guiding principles of net neutrality into Law in a more exhaustive or stricter way than existing provisions, it would nevertheless be wise not to constrict their application through overly-detailed provisions that could prove difficult, if not impossible, to implement in a sector that is in a constant state of technological and economic evolution, and which therefore demands that a certain flexibility of action is maintained. In any event, it goes without saying that the regulator will inform the Government and Parliament of any significant developments that cannot be addressed by its existing powers, and which will require new prescriptive provisions.

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Introduction

The Internet's development, especially over the past two decades, has created ties between several billion human beings. It is now a shared asset that plays a fundamental role in our economy and society, and whose proper operation over the long term is a vital issue for both States and all of the parties involved. It was in this context that the net neutrality debate first emerged in the United States some ten years ago.

The key question is how much control Internet stakeholders can rightly exert over the traffic. This implies examining operators' practices on their networks, as well as their relationships with some content and application providers. Can they block services, throttle certain types of applications, prioritise certain types of content? Or should they, on the contrary, strictly stick to the principle of equal treatment, as imagined by the Internet's original designers?

The question is also whether this principle is compatible with the sustained traffic growth on the networks, in particular mobile ones, and with the need to finance the resulting investments. Lastly, questions arise concerning the role of terminal manufacturers in the scope of net neutrality.

For some, this debate is nothing more than a commercially-motivated attempt to undermine the founding principles of a decentralised means of communication and interaction that has become an essential part of our daily existence, of our work and our lives as citizens. For others, the debate is merely an opportunistic posturing from the new Internet giants, allied, for the occasion, with online communities.

At first glance, the violence of the debate may come as a surprise. But it reflects the very strong attachment that a growing number of people have to a tool that is at once quotidian and strategic. For operators, it also reflects the importance of being able to deliver new services that are both robust and more in tune with the needs of businesses, consumers and citizens. If the debate is virulent and, at this stage, most often attached to concerns about the future than to current malfunctions, it is because everyone views what is at stake as vital to the future.

Convinced of the importance of the technical and economic stakes, and the need to guarantee the quality of the Internet, ARCEP began to examine this topic in autumn 2009.

In September 2010, after nearly a year of discussions with stakeholders, ARCEP published 10 proposals[1] whose aim was to define a sustainable, neutral and quality balance pointfor the development of the Internet. They included tools to ensure this equilibrium is maintained. The various stakeholders, operators, content and application providers and end users reacted positively to these proposals. At the time, ARCEP had indicated the proposals were just one step, and that they opened the way to a cycle of work and monitoring of Internet companies' practices that would be performed in an open and collaborative fashion, involving all stakeholders.

Several members of Parliament, both individually and as part of working groups, also explored this issue, formulated proposals and even introduced bills and produced information reports, which will be examined in this document.

In response to a request from Parliament[2], this report marks a milestone in the work that ARCEP has been engaged in since September 2010. The first part of the report frames the debate, exposes the main components of the Internet's operations and its economics, along with a reminder of the positions on net neutrality that have been adopted by Europe and in France. The second part of the report details the work that ARCEP is doing and, in accordance with the Law of 22 March 2011, provides a more in-depth look at the issues of quality of service, traffic management and interconnection.

It should be noted that the debate on net neutrality, as well as ARCEP's analysis and recommendations, are focused on the technical and economic conditions of traffic conveyance on the Internet.

This report does not deal with the debate about the control of public authorities over contents sent, received or transmitted on the Internet, although this is an essential question in a democracy. It is sometimes confused with the debate on net neutrality, and exceeds the competence of an electronic communications regulator.

1 The report "*Network and Internet neutrality – Proposals and recommendations*" is available online at: http://www.arcep.fr/uploads/tx_gspublication/net-neutralite-orientations-sept2010-eng.pdf

2 Article 21 of Law No. 2011-302 of 22 March 2011, bringing various provisions for adapting to European Union laws in the area of health, labour and electronic communications, stipulates that ARCEP will provide the Government and Parliament with a report on the, "instruments and procedures for monitoring the quality of Internet access services; the state of interconnection markets and their development outlook; the traffic management practices being employed by electronic communications operators."

1. Background and general issues

The technical and economic debate over net neutrality concerns the interaction between the parties that make up the Internet: on the one hand **operators**, and particularly **Internet service providers (ISP)**, which build and operate the networks over which the information travels and, on the other, **users** who, thanks to these networks, produce and exchange content, disseminate and use applications. Among these users of the Internet, we can make a distinction between **content and application providers (CAP)**, such as websites for instance, and residential users and businesses, in other words **Internet users**, which connect to the network thanks to terminals (computer, phone, tablet, connected TV, etc.).

Operators can provide a variety of electronic communication services, among which it is useful to distinguish between **Internet access service and specialised services**. The first provides a general connection to the Internet with no specific guarantee of quality, whereas the second provide a restricted service or set of services – such as a pay-TV package – to certain users with a controlled quality.

Debates are as much over the characteristics of Internet access service as the balance with specialised services. This means examining the way that traffic is conveyed between the different undertakings, and particularly the degree to which it may be treated differently depending on its sender, its recipient or its content. All of the players along the chain need to be taken into account, but operators – and especially ISPs – play a central role here.

After having framed the scope and the components of the net neutrality debate (section 1.1), we provide some general information about the Internet ecosystem, e.g. the players, traffic, costs and revenue (section 1.2), followed by an examination of the status of the debate at the European level (section 1.3) and, finally, the situation in France (section 1.4).

1.1 Net neutrality, a debate increasingly framed by its technical-economic dimension

Three out of four people in France today are Internet users. The Internet is part of the everyday life of consumers, citizens, businesses and public services. So the way it operates and its development have become strategic issues that are now central to the net neutrality debate.

1.1.1 What does net neutrality mean?

Net neutrality refers to a principle whereby all electronic communication networks must carry all data streams in a neutral fashion, in other words regardless of their nature, their content, their sender or recipient. This concept can apply to any network, but is particularly relevant when applied to the networks that make up the Internet.

In theory, then, the principle of neutrality means that an operator cannot block or throttle, i.e. slow, certain traffic streams on its network or, on the contrary, give higher priority to others – for instance by giving priority routing to its partners' content.

Although it has not yet been the topic of legal or regulatory provisions, or even contractual stipulations, the separation between the network's operation and the nature of the information it conveys has largely governed the Internet's development from its origins until now: the general rule is that any user must be technically capable of communicating with any other user, and of exchanging any type of content. The result is that all users who are connected to the Internet have immediate access to the entire network: the Internet is thus an open, global platform without obstacles – other than those set by Law – to freedom of expression and freedom of private enterprise. It is also a platform that is propitious to development and innovation, as the entry costs for making a piece of content or an application available to the entire Internet population are very low.

From a technical standpoint, the flow of information on the Internet is governed primarily by the principle of "best effort", in other words, operators convey the traffic as well as possible using available resources (under an obligation of best endeavour) but without any guarantee of quality or obligation over the result. In exchange, users must be certain that the information they send is handled by the network as well as the information that is sent by any other user: not better, of course, but not worse.

1.1.2 A technical-economic dimension

The swift rise in online traffic, and the never-ending progress in applications and services with high value-added are triggering lively debates over the equilibrium of this ecosystem. On the one hand, operators underscore the burden created by the steady rise in traffic in their networks while, on the other hand, users (both Internet users and content and application providers) point to all of the benefits of a neutral model, notably the proliferation of innovation and uses it enabled, and to the fact that any attempt to undermine the way the Internet works could hinder its development.

So the net neutrality debate is, first and foremost, a technical and economic one, with three core issues at stake:

- investment and increasing capacity;
- operators engaging in traffic management and managing the scarcity of bandwidth – by differentiating the traffic streams conveyed over the network, e.g. by giving priority to certain services or throttling others;
- the quality of service provided to end users.

These issues concern both operators, and particularly Internet service providers, and their relationship with users (i.e. Internet users and content and application providers). They fall fully under the purview of the electronic communications regulator, ARCEP.

In addition to operators and their relationship with users, the net neutrality debate can involve other players, such as device manufacturers and content and application providers. Some of them, especially when they enjoy a strong position in their market, can contribute to certain content or applications being favoured over others. Having control over the device's software layer, which is becoming increasingly key, can therefore allow some players to limit the choice of content or applications that can be used or, on the contrary, give preferential treatment to their partners' content or applications. The questions raised by this behaviour, and which fall outside ARCEP's purview, are discussed in chapter 2.5.

1.1.3 Other dimensions of the debate

The debate also has a societal and ethical dimension, especially in the necessary balance that needs to be achieved – when looking at the content travelling over the networks – between protecting fundamental, notably individual, freedoms, the need to maintain public order and national security, and the obligations that public powers can legitimately impose on operators as a result (e.g. blocking, filtering, etc.). These are questions that fall under the purview of the legislature, of the courts and administrative bodies other than ARCEP. They are, in the stictest sense, outside the scope of the debate on net neutrality, and they are not dealt with in this report.

Generally, operators should not take the initiative of verifying the legality of the content they convey, which of course does not exonerate all of the players from complying with the framework set by Law. Details on this issue can be found in Appendix 3.

TO SUMMARISE

The Internet has developed based on a principle of neutrality, with streams of information being conveyed over the networks independently of their nature, their content, sender or recipient. As usage and data traffic rise, the net neutrality debate is focusing on this model's ability to continue to sustain the Internet's development, both technically and economically.

1.2 The Internet ecosystem

In order to understand the economics of Internet networks, together with its evolution trends and the various aspects of the debate around net neutrality, this section outlines the Internet ecosystem by focusing on:

- the players (section 1.2.1) and the services they offer (1.2.2);
- the increasing amounts of traffic conveyed on networks (section 1.2.3) and the underlying costs supported by operators (1.2.4);
- the revenue for each player and service (section 1.2.5);
- new business models (section 1.2.6) and issues raised by them (1.2.7).

1.2.1 The players

The Internet is defined as the global, public network[3] for the transmission of data that are conveyed from any address associated with this network using the Internet protocol (IP)[4].

Today, it includes "fixed" and "mobile" networks – the latter of which enable users to connect to the Internet using mobile devices.

Very simply put, three categories of player are involved in the Internet's operation:

- electronic communications operators which deploy and operate the networks and make up the global mesh;
- content and application providers (CAP)[5] which supply their content and applications via the network;
- residential and business users, collectively referred to as Internet users, which are either individual persons or legal entities who access the network for their own needs, thanks to terminals.

The last two categories constitute the users of the Internet. Some parties may belong to both categories: an Internet user may be both a CAP, if they produce and transmit content over the network, and a consumer of content.

Users interact with one another – an Internet user with a CAP, two Internet users between themselves, etc. – to exchange information or access content and applications, using the electronic communication services supplied by operators.

3 This network is comprised of some 50,000 autonomous systems recognised by IANA ("Internet Assigned Numbers Authority").

4 A protocol is a set of conventions and rules for the exchange of a certain type of data. The Internet protocol, or IP, relays datagrams across network boundaries, providing best effort delivery.

5 In 2010, ARCEP had used a different terminology, referring to ISV (Information, society service vendor, or PSI in French), following the definition taken from Directive 2000/31/EC (Electronic commerce directive) instead of CAP. Today, BEREC (Body of European regulators for electronic communications) documents refer to CAP, which underlines the distinction between content and application on the one hand and Internet access service and specialised services on the other hand. ARCEP proposes to reflect that choice by also referring to CAP (FCA in French) in its documents.

The operator category can be subdivided into two sub-categories: **Internet service providers (ISP)**, which enable CAPs and Internet users to connect to the Internet, and **technical intermediaries** that ensure the existence of a global mesh and interconnect ISPs (these include IP transit providers in particular, whose business will be detailed further on). Thanks to their international footprint in particular, some ISPs may also act as technical intermediaries.

Terminal manufacturers are also playing a role, by providing residential and business users with electronic equipment that allow them to access the network: computers, mobile phones, tablets, etc. Noticeably, some terminal manufacturers are also increasingly acting as CAPs, and vice-versa.

A more complete profile of the players can be found in Appendix 4.

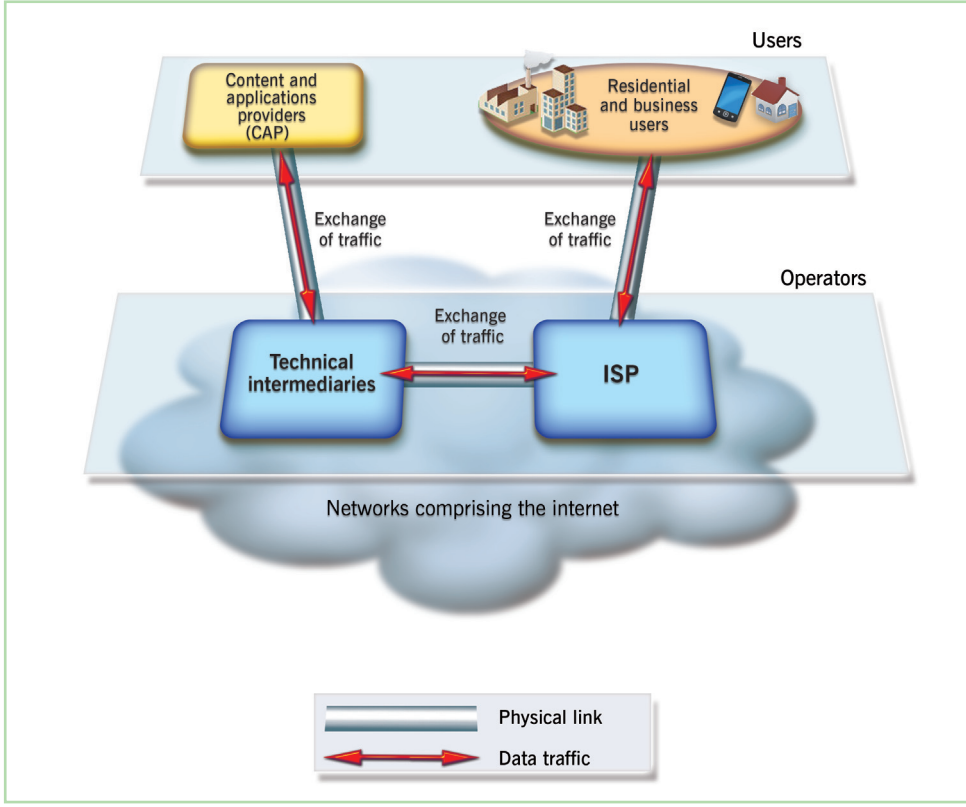


Figure 1. ***Schematic representation of the Internet's stakeholders***

Users establish a connection with one another that is handled by the operators who convey traffic.

1.2.2 Services

ISPs, which are electronic communications operators, can provide their customers with a range of services, including Internet access service and specialised services.

- An Internet access service allows customers to send and receive data to and from the entire Internet. This connectivity service provides access to an array of applications and the ability to exchange content, such as access to websites – e.g. Facebook, Twitter, Google, Dailymotion, PagesJaunes – e-mail, file sharing, etc. Internet access service is closely bound up with the concept of best effort delivery, which refers to the way in which data is conveyed over the Internet – namely operators transmitting data streams to convey them from their point of departure to their destination, with no guarantee on performance but only an obligation of best endeavour.
- Unlike Internet access service, specialised services (or managed services) provide access to applications and content with a controlled quality. An operator may market a small selection of content or applications whose technical properties are controlled from end-to-end, either on its own network or thanks to agreements with other operators who are responsible for conveying traffic. These services may include television (IPTV) or video on demand delivered over an ISP's network, or telephone services. They may also include some business services, such as VPN (Virtual private networks).

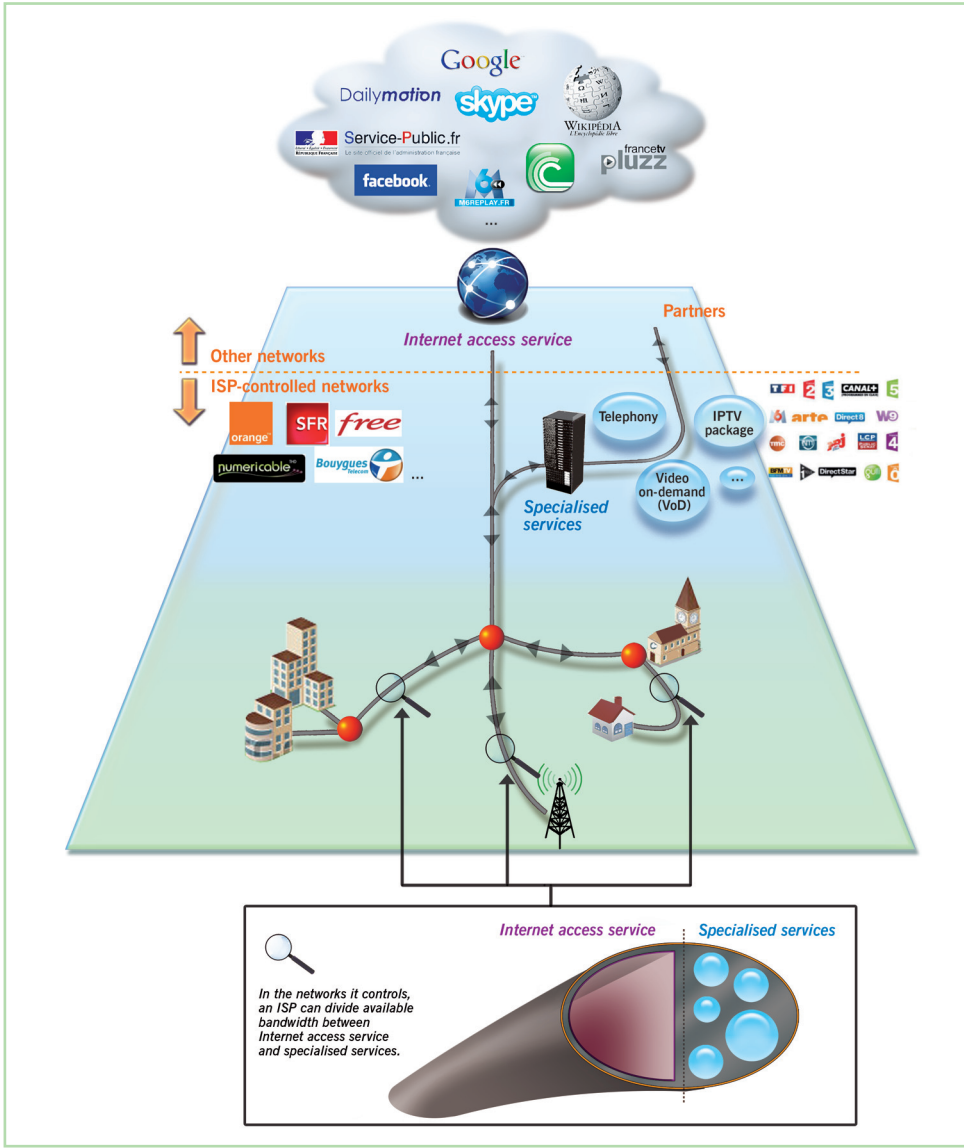


Figure 2. ***The two main services marketed by ISPs on their networks.***

Specialised services may be supplied in parallel with Internet access services which provide access to Internet content and applications. (The above examples are not exhaustive and are solely for illustrative purposes.)

1.2.3 Traffic

The amount of traffic exchanged over the Internet is increasing steadily. It is estimated that global Internet traffic will grow by close to a third every year (CAGR 2012-2015), although this rate of increase is slowly tending to diminish. This increase is by no means a new phenomenon, but operators do point out that it requires them to make massive investments in maintaining and improving their networks, and to increase the capacity of their equipment deployed throughout the system on a regular basis.

Growth is especially noticeable on mobile networks, with data traffic worldwide virtually doubling every year. In France and elsewhere, this phenomenon is being spurred by the growing penetration of smartphones which allow users on the move to access the various Internet services with ease.

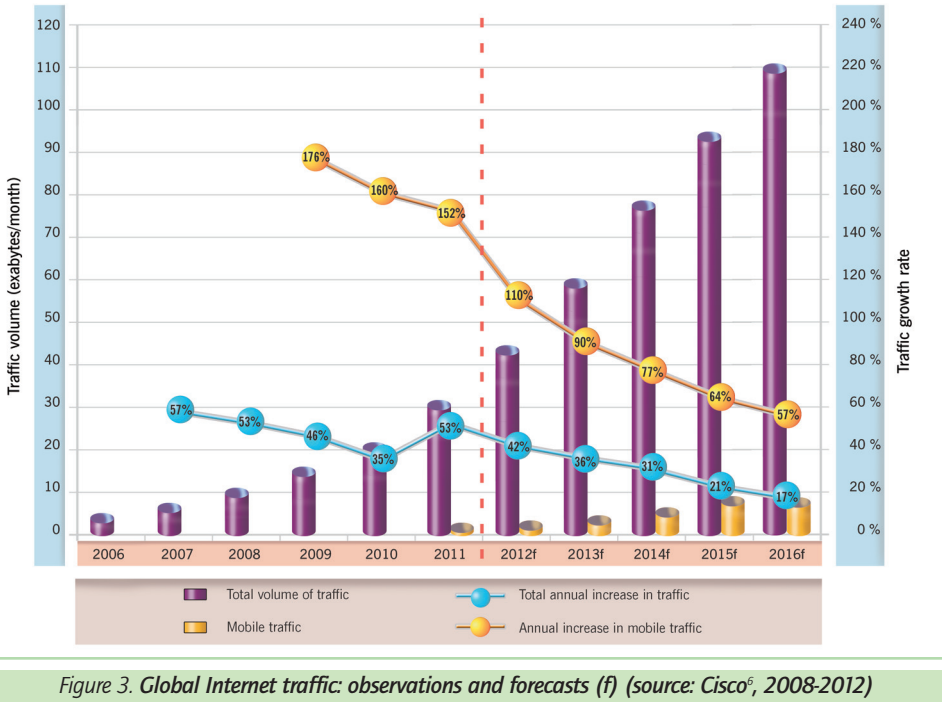


Figure 3. ***Global Internet traffic: observations and forecasts (f) (source: Cisco[6], 2008-2012)***

6 American firm Cisco Systems, whose business includes the production of network equipment, publishes the "Visual Networking Index" every year which provides traffic forecasts that are taken as a reference in the industry and very little disputed – as no comparable alternative source exists. The 2008 to 2012 editions are used in this report. A retrospective assessment of these indexes confirms that their forecasts are relatively reliable: the figures published in 2008 predicting traffic growth for the next three years resulted in a margin of error below 20%.

Traffic trends in France are quite close to those at a global scale. At a national level, the increase in amounts of traffic on fixed networks is essentially driven by the growth of individual use, as the growth of the number of fixed users is now slowing down (the number of fixed broadband and ultra-fast broadband users increased by 8% in 2010 and 6% in 2011). ARCEP does not monitor precisely traffic volumes on fixed networks. It estimates this volume reached several millions of terabytes (or several exabytes) in 2011. On fixed networks, as 80% of traffic is caused by linear IP TV[7] which is conveyed by multicast, it is relevant to distinguish between traffic at users' level, around ten exabytes, and traffic in core networks which is approximately five times smaller. Indeed, linear IP TV, as an operator's specialised service, is first conveyed as a single signal in core networks and is then duplicated for each end user in the network's last mile, close to users. Traffic volumes consequently depend on the location in the network.

On mobile networks in France, while individual use grows, the number of users also follows a steady pace (the number of active 3G users increased by 32% in 2010 and 22% in 2011). Consequently, traffic volume rose by 120% in 2010 and 80% in 2011, resulting in a total conveyed traffic of 55,922 terabytes in 2011[8].

The overall increase in traffic is mainly concentrated around a handful of undertakings, namely very large content and application providers which have emerged on a national scale, and particularly on a global scale, along with technical intermediaries – known as CDN, or content delivery networks – devoted to improving the flow of content. These stakeholders often host or convey videos over the Internet.

Watching videos online is indeed becoming an increasingly popular activity and generating a great amount of traffic on the networks, flowing from CAPs to Internet users. This increase in traffic has two particular features: it is concentrated around a small number of CAPs and it is asymmetrical, in other words it is mostly conveyed in one direction, from the networks that host and run the videos to the ISPs that serve the end users who watch them.

The subsequent chapters in the report are predicated on a steady increase in traffic, as depicted in the graph, with a gradual decline in the annual rate of increase. The chosen forecast scenario does not involve a dramatic rise in traffic, i.e. no sudden, massive surge. Such a dramatic rise could occur, for instance, if all Internet users were to very quickly become heavy viewers of online video. The likelihood of this happening is occasionally debated, but it does seem rather improbable. Should it occur, however, it could affect how some of the trends presented in this report play out.

7 According to a study by Idate for CNC in 2012, professional video represented 90% of traffic in fixed broadband and ultra-fast broadband access networks in 2010; linear TV weighed 90% within it and on-demand video services 10% http://www.cnc.fr/web/fr/actualites/-/liste/18/2001740

8 ARCEP's annual mobile obervatory, 2011. http://www.arcep.fr/fileadmin/reprise/observatoire/marc-an2011/obs-annee2011-prov.pdf

1.2.4 Costs

ISPs are having to make sizeable investments to maintain a high enough quality of service at a time when Internet traffic is increasing. When studying the network costs shouldered by an ISP, a distinction needs to be made between:

- costs that correspond to access networks (at the local level);
- those that correspond to backhaul and backbone networks (network core, at inter-departmental and national level);
- and those that correspond to national and global connectivity (peering and transit with other operators).

These costs may be capital expenditures – to increase the density of a regional backhaul network or to deploy a new access network, for instance – or recurring costs.

Fixed and mobile networks differ chiefly in terms of proximity networks, in other words access networks. Fixed systems are most often based on wireline access networks (France Telecom copper local loop, optical local loop, etc.) which represent a capacity dedicated to each end user and a relatively fixed cost. On mobile networks, access is supplied by a wireless interface (2G, 3G, 4G) – using radio spectrum resources – between the devices and base stations, which represent resources that are shared by users and costs that vary according to traffic.

a. Variable traffic costs

In this section we examine the situation of an operator whose network traffic is increasing. We provide an estimate of the resulting additional costs which are to enable the operator to handle this increase in traffic.

In these scenarios, the existing network is upgraded to keep up with rising traffic. These scenarios do not, however, take the deployment of new generation access networks (fibre, LTE) into account. The purpose here is therefore to provide an estimate only for the variable costs tied to the regular increase in traffic on networks, and not to examine the sizeable expenditures tied to ultra-fast broadband network rollout strategies, the goal of which goes far beyond the adjustment of networks to regular increase in traffic.

There is indeed a significant margin for upgrading wireline network cores to keep up with increasingly heavy usage. Today, for instance, if an ADSL connection typically provides download speeds of around 5 to 10 Mbps, the capacity provisioned by operators in the core network stands at around 100 kbps (or 0.1 Mbps). This corresponds to the fact that, at any given time (during peak traffic hours) and throughout the ISPs' base, customers only solicit 100 kbps in bandwidth from the network. This apparently low figure reflects the fact that users are not all online at the same time and they generally do not exchange data on a continual basis. With the steady rise in usage, upgrades to existing networks will therefore go by way of increasing the capacity of network cores.

Wireline networks

This section examines the network costs shouldered by an ADSL ISP when relaying traffic, and how these costs vary when traffic increases. The imagined scenario corresponds to an upgrade of the backhaul and backbone network – i.e. operators' ongoing upgrades – and not to the deployment of new generation access networks.

By employing the economic models at its disposal[9] and wholesale tariffs from France Télécom (unbundling, bitsream), ARCEP can estimate the average cost shouldered by a generic, new entrant, ADSL operator providing fixed Internet access with an average profile[10], depending on average traffic per-user. These are only network costs, and not the whole set of costs involved in producing an Internet access solution (commercial costs, after-sale service costs, etc. are notably excluded).

These calculations for a generic, new entrant, ADSL operator provide the following results, which are reflected in the graph (see next page):

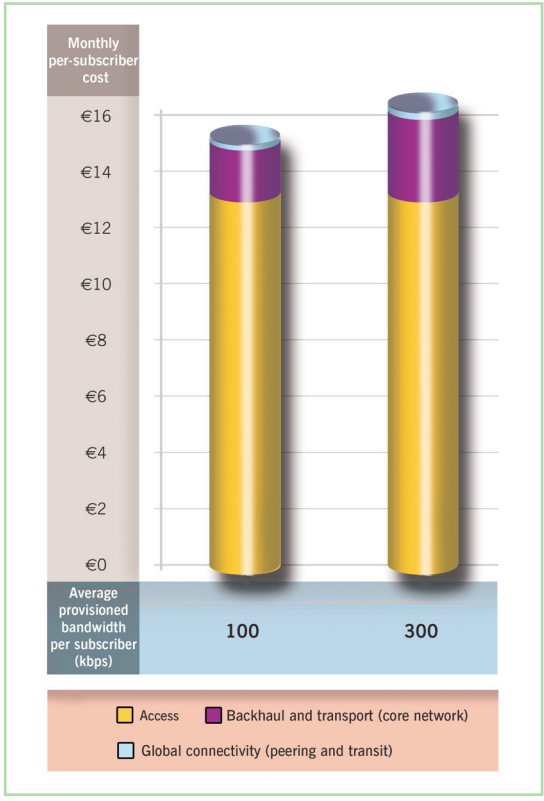
- fixed access network costs (copper local loop in this instance) stand at around €13 per subscriber a month (around 90% of network costs). These costs are virtually unaffected by the amount of traffic on the network. It should be noticed that this figure does not include the deployment of new ultra-fast access networks;
- backhaul and backbone network costs currently represent around €2 per subscriber a month. A portion of these costs – which corresponds to activated equipment for unbundled access and to bitsream – does increase as traffic becomes heavier. For instance, considering the generic operator as described above, between an average subscriber and a heavy subscriber (i.e. who generates three times the average traffic)[11], this represents an increase of around €1 to 1,5 per subscriber, per month. This increase is strongly dependant on technologies selected by operators and it also differs between geographical areas, resulting in levels of increase ranging in a 1:10 ratio. An operator which heavily relies on bitsream generally bears higher costs, while switching from ATM technologies to Ethernet technology is supposed to, and already does, reduce these costs ;
- the cost to an ISP of ensuring global connectivity is very low: around 10 eurocents a month per fixed line subscriber. This cost is generally proportional to traffic, but remains small in comparison to other costs. It is unlikely that this cost, which mostly corresponds to IP transit costs, will increase significantly as, up until now, the increase in the traffic exchanged between operators has been accompanied by a decrease in IP transit prices. The situation would differ if transit prices stopped to decrease, bringing a ten-year trend to a halt.

9 Regulatory model for unbundled access cost and backhaul cost, published in September 2012.

10 In this scenario, the DSL operator holds a 25% market share. 87% of its suscribers benefit from unbundled access while the other 13% are served through bitstream. For unbundled access, the backhaul network relies exclusively on Ethernet technology and 3,000 MDF are unbundled. For bitsream access, the networks relies partially on DSL COLLECT ATM wholesale offer (50%), DSL COLLECT IP (25%) and DSL COLLECT ETHERNET (25%). Costs include investment costs and recurring costs. Underlying assumptions are detailed in Appendix 5.

11 The assumption is an an average consumption of 100 kbps per customer during peak traffic times. An operator nonetheless points out that the average consumption observed on its network is already close to 200 kbps during peak traffic times.

Figure 4. ***Network costs shouldered by a generic ADSL ISP, depending on the average consumption of its users.***



These results, the details of which are presented in Appendix 5, show a correlation between the amount of traffic on networks and the costs shouldered by a generic ISP.

A part of these costs is effectively dependant on traffic, however this part is moderate. For an operator like the generic ISP described above, a consumption which is multiplied by 3 could lead to an increase in network costs for providing Internet access of 6 to 12%. When divided by the amount of traffic in core networks, this translates into an incremental cost for conveying data in backhaul networks of a few euros per additional Mbps per month, with strong differences depending on technologies and operation modes[12].

By applying these estimates to the French market as a whole, the annualised incremental cost of relaying all of the traffic on fixed networks would be some €100 million a year, with an uncertainty range that makes it impossible to obtain a more accurate calculation at this stage. So far, the long-term trend has been one of a decrease in the incremental cost per unit of traffic thanks to technical progress, which comes to offset the impact of the overall increase in traffic volume. As a result, even if regular investment is necessary so that backhaul networks remain appropriately sized to convey traffic, the total cost of relaying traffic on fixed networks does not seem to increase significantly.

Wireless networks

By employing its mobile network economic model[13], the Authority can also estimate the average cost to a mobile operator of conveying Internet traffic. These calculations must nevertheless be taken with some caution to the extent that this model, which was initially designed for (voice) calling traffic, has not yet been

12 The estimated incremental cost is slightly lower than €1 per Mbps per month for unbundled access and Ethernet technology (ARCEP's cost model), €6 per Mbps per month for bitstream with Ethernet technology (France Télécom tariff) and up to €70 per Mbps per month for bitstream links relying on ATM technology (France Télécom tariff). Consequently, the average cost heavily depends on the weight of various operation modes and technologies. Note that the cost of bistream particularly derives from its implementation in unbundled, often less concentrated areas.

13 Technical anc economic model for mainland operator's network costs.

specifically calibrated for data. The chief purpose of the results presented here is therefore to give some idea of scale. ARCEP is about to conduct additional works to estimate the costs of conveying data on mobile networks with better accuracy in the next months.

Today and as a first estimation, it appears that costs on mobile networks are significantly higher than fixed networks and may be included in a range varying from several hundreds to a few thousands euros per Mbps per month. This very significant difference comes from a difference in scope, as this cost includes the radio access network cost, the size of which depends on traffic volumes as opposed to fixed networks where the abovementioned cost did not include the local loop, which is designed independently from traffic (as long as it is not replaced).

However, average consumption per user and mean provisioned capacity per subscriber are significantly smaller than on fixed networks, as they are not higher than a few kbps per subscriber.

By applying these estimates to the French market as a whole, the annualised incremental cost of relaying all of the traffic on mobile networks would be some €1 billion a year. These traffic-related costs, which are approximately ten times higher than on fixed networks, explain why mobile Internet access plans' tariffs are more often dependant on conveyed traffic and consumption volumes. This difference between mobile and fixed costs also explains why the cost of mobility should essentially be borne by mobile suscribers, as only the user has the possibility to decide whether he or she sends or of receive data in mobility. The other user he or she is communicating with has no influence on their choice and the costs the first user is generating.

b. Issues linked to investments

Operators are spending massively, on a regular basis, to improve their networks. Between 2006 and 2010, spending by operators in France fluctuated between €6 and €7 billion annually – reaching €7.3 billion in 2010 and €7.9 billion 2011, with the last two years including acquisition of licences to use spectrum bands. Excluding acquisition of licences, investment remains fairly stable.

Two main types of expenditure can be distinguished, and this for both fixed and mobile networks.

The steady increase in traffic demands, first, ongoing upgrades and frequent increases in network capacity, as mentioned earlier. On wireline systems, this chiefly involves improving backhaul and backbone network performances. On wireless systems, costs are spread out across all network levels, right up to the access network where the capacity of the base stations needs to be increased. These expenditures therefore correspond to the steady rise in traffic. The calculations presented in the previous section make it possible to estimate the orders of magnitude of the amounts involved to convey all traffic: a hundred million euros a year for fixed networks, one billion euros a year for mobile ones. These figures provide an indication on the basis on which traffic growth rate has an impact.

Parallel to these ongoing upgrades, investments on another scale are being made in the deployment of new generation access networks – both FTTH (fibre to the home) on fixed networks and LTE on mobile. The distinction from spending on ongoing upgrades to backhaul networks is particularly overt with fixed networks – where FTTH rollouts mark a clear disruption from the old system, with and a tremendous leap forward in access network capacity, significant infrastructure works and sizeable investment – whereas on mobile networks, because access is shared between users, upgrades are more ongoing and the approach similar to the one used in backhaul networks, and more focused on modernisation of electronic equipment.

For operators and public authorities, next generation access network rollouts will represent a capital expenditure of around €30 billion over the next 15 years. Operators are not only working to keep up with the rise in traffic when deploying these new access networks, but are also pursuing other goals such as disruption in usages. The development of multi-device usage on the same wireline connection – in other words the fact of having several devices in the home using the same connection – and the development of new applications, such as high-definition and 3D TV, services taking profit from improved uploading speeds, etc. may thus be expected. Not all of these are available on all of today's fixed access networks, and they could be marketed through the operator's specialised services on next generation networks.

This means that new network rollouts are not motivated solely by the increase in Internet traffic, but are part of much broader momentum that depends on operators' strategies, public authorities' initiative favouring territorial planning of digital policies, and users' choices. Thanks to positive externalities generated on the whole economy by new networks, and considering the amounts and timescales of foreseen investment, their funding is a specific question which should be distinguished from the financing of continuous modernisation of existing networks.

1.2.5 Revenue

a. Operator and CAP revenue from Internet access

Electronic communications operators declared in France generate some €40.8 billion (in 2011) in revenue annually. This figure includes all activities tied to operating electronic communication networks, such as retail market (residential and business) telephony services and Internet access, along with other activities such as capacity provided to other operators. Looking only at Internet access services for retail market customers, operators' revenue for fiscal year 2011 is estimated at €10.6 billion.

It should be noted that Internet access service revenue is mainly driven by the number of users. For fixed Internet access, today's retail market is shaped by unlimited offers which do not differentiate tariff according to traffic volume: consequently, increasing individual usage does not mean revenue is growing. The number of users is now growing at a moderate pace (+6% in 2011).

Mobile Internet access market is different, as tariffs and consumption are still correlated. Two kinds of correlation exist: either an operator provides with a range of plans which offer several levels of consumption and, consequently, several levels of tariff, or it provides with only one plan which comes with a "fair use" provision, resulting in traffic being slowed down or blocked once a threshold has been reached. While the latter expanded significantly in 2011 and even more in 2012, the retail market remains shaped by ranges of segmented plans, which keep a fairly strong link between consumption and price. Simultaneously, the number of mobile Internet users keeps growing at a steady pace, resulting in a rise in revenue.

Unlike electronic communications operators, content and application providers (CAP) include undertakings with a broad spectrum of activities and income levels – many of which are based outside of France, and even outside the European Union.

One of the most lucrative businesses for CAPs offering content and applications which are accessed via Internet access is online shopping, or e-commerce, which in France generated €38 billion in sales in 2011 (according to Fevad[14]). E-commerce sales have been rising steadily year-on-year, although they still only account for a fraction of total retail market sales – which stood at €479 billion in 2011, according to INSEE. And only a small portion of these €38 billion is earned by content and applications providers as a commercial commission.

CAP also earn revenue from online advertising: €2.6 billion in France in 2011 (source : Capgemini Consulting), which marks a 11% increase for an advertising market worth €12.7 billion, all media combined, i.e. newspapers, TV, Internet, etc. (IREP), of which €3.5 billion was earned by television – roughly the same as in 2010.

A wide array of other online services also generate income. This may, for instance, include charging for access to an online service, such as streaming music, or payment for a solution delivered online, such as listing in a directory or search engine, or a subscription to a cloud computing or storage service[15].

It seems impossible to determine with any real accuracy the value-added tied to all content and application providers' business: first, because it is spread out across the entire planet and the percentage of their business that is in France is not always known and, second, because the activities that do earn money are extremely varied, with some being tied to intangible activities taking place solely online, such as advertising, while others are based in part but not entirely on the Internet, such as e-commerce where the Internet supplies the transaction platform, but which generally also involves shipping physical goods – in which case CAPs earning only accounts for a tiny share of the value of the product. Video content also has the particularity of relying in part on online distribution, but resulting revenue is also earned by several non-Internet players, according to the schemes detailed below.

In the strictest sense, the value added generated by content and application providers can include the revenue earned by operations conducted entirely online: primarily advertising and a few other services. A small percentage of the income generated by other paid, Internet-based services – e.g. online shopping, paid content, etc. – is also earned by CAPs. This enables us to estimate, at this stage in the analysis, that content and application providers in France generate an annual income of approximately €5 billion (which should be taken as an order of magnitude). This estimate strongly depends on methodology[16].

14 Fevad: French Federation of e-commerce and mail order sales (Fédération du e-commerce et de la vente à distance)

15 Idate, which delineated CAP with a methodology close to the one presented in this document, found out that "Internet services" generated €26.7 billion in the European Union in 2011. ATKearney chose a broader approach and estimated that "online services" weighed €242 billion in the world in 2008. Even by comparing these figures on similar areas, they still diverge, one being approximately twice as big as the other.

16 CSA – Report on on-demand AVMS active in France (June 2011)

b. The particular situation of audiovisual media content, between specialised services and Internet access service

The net neutrality debate is closely bound up with the growth of Internet traffic, which is itself being spurred largely by the development of media content available for viewing online. As a result, the providers of video content – such as TV channels/networks and video platforms – constitute a special category of CAP.

Among the video content available on the networks, a distinction can be made between live TV programmes and on-demand audiovisual media services (ODAVMS). ODAVMS include catch-up TV and video on demand (free and paid, per-view or by subscription). For all of this content, a television channel, and content and application providers in general, may choose between distributing their content through a specialised service – such as ISP's bundled solutions which can include a pay-TV package – and over-the-top (OTT) delivery, in other words via Internet access service.

To distribute content through a specialised service, an agreement needs to be signed between the distributing ISP and the CAP. Such agreements may involve the CAP paying the ISP a fee: the Internet service provider will seek to secure a fee to distribute content that it carries with a controlled quality, but the content and application provider may also seek to earn a fee – arguing that its content enhances the service (TV package) that the ISP is offering its customers. Over-the-top delivery, however, does not require any direct relationship with the ISP and is less costly, but there is no guarantee on the quality of the stream, nor on the easiness of access in comparison to the functions of ISPs' "boxes".

- Linear TV

In France today, 23.2% of TV viewing time at home is over an ADSL network, in other words a specialised service sold by an ADSL operator as part of a bundle with Internet access service. This form of TV reception is quickly gaining in popularity. Terrestrial broadcasting now only represents 48% of TV viewing time, satellite 18.7% and cable 8.7%[17]. It should also be mentioned that, at the end of 2011, around 12.3 million households were eligible to receive an IPTV service as part of a bundle with ADSL access[18].

Live TV broadcasting on fixed networks is based chiefly on these specialised services. Television channels may also engage in over-the-top delivery of programmes via their websites, for instance, but they will carry no control of quality. With specialised services, ISPs can earn revenue for conveying pay-TV packages.

- Catch-up TV (CUTV)

Catch-up TV (CUTV) is becoming increasingly popular, and today more than 60% of Internet users watch TV programmes in catch-up mode. CUTV has created a new opportunity for TV networks, and revenue is on the rise – coming to around €30 million in 2011[19]. These services are delivered either over-the-top[20], i.e. on the open Internet, or through an ISP's pay-TV solution. In the second instance, the ISP generally pays for the free catch-up TV services. Paid catch-up TV offers have also developed[21].

17 Source: Médiamétrie/ARCEP, Q1 2012
18 Source: ARCEP Observatory
19 *Source: Les dossiers du CNC,* No. 321, March 2012. This figure reflects only video advertising
20 Examples: M6 replay, France TV Pluzz...
21 Operator Free sells a "priority pass" (pass prioritaire) for €0.99/evening or €3.99/month, that guarantees access to the Freebox Replay site – which groups all of the channels available in catch-up TV – from 7 to 10 pm, i.e. during the heaviest traffic times.

- **Video on demand (VoD)**

Paid video on demand (VoD) services can be sold either by TV channels/networks themselves – such as the Canal Plus Group – by ISPs or by other content and application providers, such as Apple. In France, video on demand is developing rapidly, and in 2011 it generated €203 million in revenue.[22] Even though VoD services do exist through Internet access service, around 90% of this revenue today come from content broadcast via specialised services. Here, the distributors, namely ISPs, earn a substantial share of the income generated by each purchase[23]. The remaining 10% are supplied via Internet access, e.g. on video sites, that offers no guarantee of quality or availability but which, under certain circumstance, could well satisfy users' needs.

There are free video platforms available on websites such as Dailymotion and YouTube which rely on Internet access to allow viewers to stream videos. They may earn their money on advertising, and by developing a paid video on-demand service.

In future, the balance between Internet access and specialised services in the supply of video content could evolve, as a result of several developments. First, content and application providers – whether TV channels or others – could seek to develop their own OTT content, particularly if access on the open Internet offers a high enough level of quality. Second, over-the-top broadcasting which, up until now, has been confined to computers, is expanding to new devices such as tablets and Internet-ready, or connected televisions[24]. In France, it has been estimated that video contents (mainly streaming and peer-to-peer) represent almost half of Internet access traffic on fixed networks and close to a quarter on mobile networks[25], and these figures are still expected to rise in future.

As a result, the business model for conveying TV content could evolve in the coming years[26] – with one of the most outstanding changes being a possible decrease in the revenue that operators earn on video on demand supplied via specialised services, if OTT video gains in popularity. But Internet service providers also have the option of developing new specialised services – particularly as ultrafast broadband is opening up opportunities for innovation that ISPs can capitalise on.

c. Market balances

According to abovementioned values, it is possible to estimate Internet access service revenue (€10.6 billion) and CAP revenue (around €5 billion) in France. However, comparison is limited by the difficulty of evaluating CAP revenue at a national scale when they have global businesses. Besides, interconnection revenue figures are relatively small (see Figure 11).

22 Sources: GfK, NPA Conseil, CSA, 2011

23 Distributors earn 29% of the retail price, excl. VAT, of a VoD service on the television via a specialised service (source: IDATE market report on the business models of on-demand audiovisual media services in France, June 2010)

24 Televisions connected to an ISP's IP box already constitute connected TVs. What we are referring to here are newer devices being rolled out by television manufacturers that allow users to connect their TV directly to the Internet.

25 *L'utilisation des réseaux haut débit en France (The use of broadband networks in France)*, Idate, June 2012.

26 *La television connectée (Connected TV)*, November 2011, Report to the French Minister of culture and communications and the Minister responsible for Industry, energy and the digital economy

Comparing CAP and ISP leads to reveal different dynamics. Some high-profile CAP are enjoying high growth and significant margins, some of them leveraging on very strong market positions. Performance however varies between CAP, their business being structured by fast renewal processes, frequent disruptions and competition at a global scale.

While Internet access service also enjoys significant growth (partially driven by mobile Internet's surge), operators underline the electronic communication market is roughly stable, in France and comparable countries.

Additionnaly, these players may be subject to various regulatory and fiscal regimes. While CAP can locate a part of their business outside France or the European Union, ISP are necessarily based on national land.

On the other side of the chain, the sale of telecommunications devices in France is close to €6 billion (telecom equipment sold to private individuals and businesses, according to IDATE, 2011). It can be added to the sale of IT equipment, around €14 billion (IDATE, 2011), a significant part of which plays a role in allowing users to access the Internet.

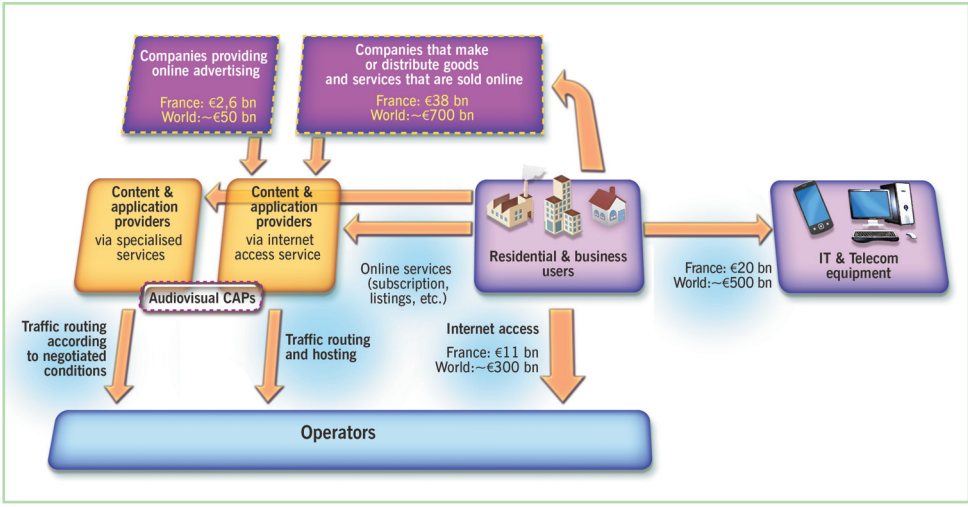


Figure 5. ***Online financial streams and revenue earned (2011) by the sector's players.***

The arrows provide examples of the financial streams between stakeholders. E-commerce has the particular feature of having only a small portion of its revenue earned by CAP, as it generally concerns the sale of physical goods (Sources: FEVAD, IDATE, BCG, AT Kearney, ARCEP)

1.2.6 The new models

This thriving ecosystem – in terms of both the amount of traffic being conveyed and the revenue streams generated over the networks – raises the question of how to share the value and to pay for the infrastructures : which players of the ecosystem must contribute, to what extent, and through what mechanisms? Content and application providers are generally satisfied with the current situation, but some of the operators would like the investment burden to be allocated differently.

Some ISPs are thus working to develop new business models. Through new applications, and especially specialised services that capitalise on the deployment of new access networks – such as TV and video on demand services on fixed networks – operators can hope to generate additional income from end users and the content providers involved.

In the retail market, this could involve differentiating Internet access offers to obtain a greater contribution from users. However, in a competitive Internet access market, whether fixed or mobile, it is not easy to increase prices if costs are not really increasing, or if users do not perceive *a priori* a substantially higher value in the service.

Operators can also try to have players located higher up the value chain help cover their costs: especially other operators and content and application providers. Interconnection relationships that are at the heart of the Internet's operation are undergoing tremendous changes, in some instances creating tension between undertakings who disagree over the terms of their mutual connection.

The necessity, the usefulness or, on the contrary, the problems and risks involved in these changes are eliciting lively debates between stakeholders along the value chain.

Some ISPs want to introduce billing for conveying traffic over their access networks, which would send out an economic signal to CAPs[27]. They argue, first, that, like any price attached to the use of a resource, this economic signal would create an incentive to use the network more efficiently and more carefully. As a result, CAPs would have more incentives to temper the rise in the traffic they generate – by optimising their video encoding, for instance. Beyond that, sending out a price signal would mean increasing CAPs' contribution to network financing. Although this contribution alone would not constitute a significant part of the required expenditures in new access networks (around $30 billion over 15 years in France), ISPs argue that it could reflect all or a portion of the ongoing modernization costs that are directly tied to the rise in traffic on the network, which is particularly beneficial to CAPs' development.

Players close to CAPs regularly question these arguments[28]. Their first contention is that content and application providers do not need to make a greater contribution to network financing: looking only at the cost of backhaul and backbone networks, where equipment needs to be replaced on a regular basis, the decrease in the price of this equipment would first tend to offset the increase in traffic. On the other hand, if we take into account the deployment of NGA networks (particularly optical fibre and LTE), capex needs well exceed the ability to pay of CAPs who generate income thanks to Internet access. On the whole, content and application providers argue that they already help pay for the global networks, at the very least

27 This hypothesis is explored in the report titled, A viable future model for the Internet, published in 2011 by the firm A.T. Kearney, which was commissioned by France Telecom, Deutsche Telekom, Telecom Italia and Telefónica (Spain).

28 A counter-analysis to the above report can be found notably in: Are traffic charges needed to avert a coming capex catastrophe? (Robert Kenny, Communications Chambers, 2011).

by paying for their own Internet access, and that raising the barriers to entry for CAPs could well hinder the innovation momentum in the Internet ecosystem. These players also argue that, if an incentive to make reasonable use of existing resources were to be put into place, the economic signal should be sent to users, through retail market products. They worry that charging CAPs a fee that is proportionate to their traffic would upset business models based on the exchange of large volumes of data, without necessarily generating substantial revenue[29].

A lively debate is taking place over the opportunity to introduce a revenue stream from CAPs to ISPs by charging for the incoming traffic on the ISP's network, and over the question of how much this would affect the ecosystem. These questions require the regulator's attention.

At the very least, it should be noted that the financing schemes being planned by the players are not currently capable of contributing in a significant way to the financing of new generation networks. At this stage, they are more part of negotiations between the players, with the aim of distributing the cost of conveying traffic over existing networks.

1.2.7 Challenges

By implementing new models designed for finding new sources of revenue or optimizing existing resources, the market players are developing practices that may have long-term consequences for the Internet ecosystem.

- The technical and economic conditions of the relationships between Internet companies are evolving rapidly. The way that links and financial streams are scaled can create tension between players who disagree over interconnection conditions.
- To manage the increase in traffic, operators may seek to differentiate the way streams are routed. This is what is referred to as traffic management, and can consist in throttling or blocking some content or giving higher priority to others. Under certain circumstances, such practices, which must remain transparent, may violate the principle of net neutrality.
- Traffic management practices may be intended to improve the quality of service for certain content or certain users, which may be detrimental to the "best effort" Internet. This approach with premium offers is particularly effective for an ISP if the quality of "best effort" services is low. So it is important to monitor it in order to prevent a global deterioration.

These issues frame ARCEP's work, which is detailed in the second part of this report.

29 One point that is regularly stressed is the lack of correlation between a CAP's revenue and the volume of traffic it helps generate: the revenue-to-traffic ratio can be high for an online shop but low for a video site.

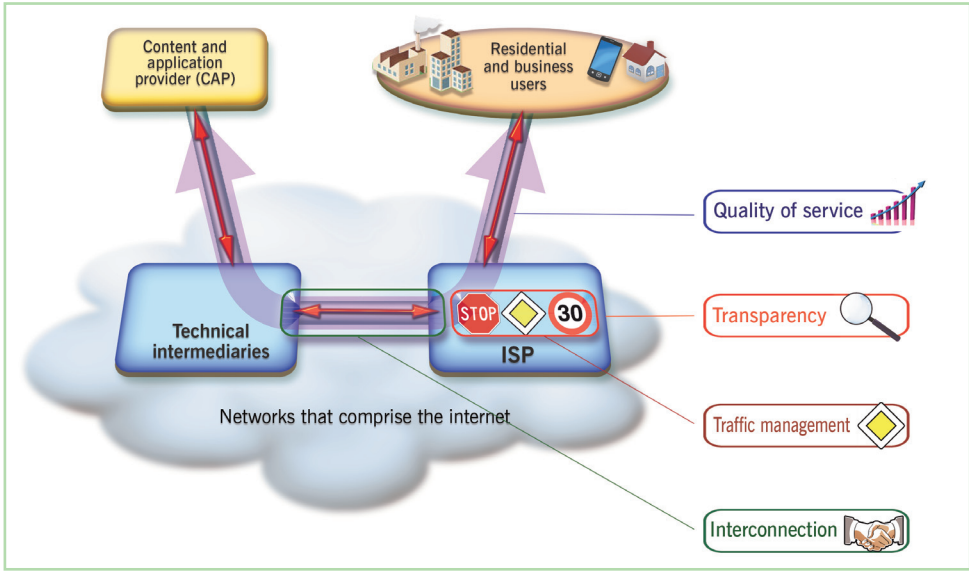


Figure 6. ***Schematic representation of the issues and ARCEP's areas of endeavour: transparency, quality of service, interconnection, traffic management***

TO SUMMARISE

Operators earn most of their revenue from the sale of Internet access services, through which end users access all of the content and applications available on the Internet. Specialised services are sold with a controlled level of quality.

Increase and concentration of the volume of traffic, and the development of new generation access networks (FTTH, LTE) mean new expenditures for operators.

Some operators are looking for a greater contribution of CAPs which could participate in the cost of conveying the traffic over existing networks. CAPs are reluctant to this contribution.

However, the amounts involved do not seem able to provide a significant share of the funding required for the deployment of next generation access networks.

1.3 The situation in Europe

The EU (European Union) institutions have identified what is at stake with net neutrality, with the European Commission paying particularly close attention to the matter. Member States act chiefly through their national regulatory authorities (NRA), with the exception of the Netherlands.

1.3.1 Actions at the EU level

The topic of net neutrality emerged in Europe during the work on the new European regulatory framework, i.e. the Telecoms Package. When adopting the new framework, the European Commission recognised the importance of this debate and the issues it raised, underscoring its commitment to an open and neutral Internet. In a communication from April 2011[30], it announced that it was closely monitoring the state of the market, and called on BEREC – the Body of European Regulators for Electronic Communications – to provide it with an expert view on current practices that would allow the Commission to assess whether more prescriptive action was needed.

Neelie Kroes, Vice-President of the European Commission in charge of the Digital Agenda, commented on the first series of BEREC works published at the end of May 2012[31]. The Commission was waiting for it before deciding on its future course of action. The Commissioner believes that there is no need to introduce any biding legislation, but consumers must be made able to make informed choices. This is why she announced a recommendation on transparency, operator switching and certain aspects of traffic management. A public consultation[32] has thus been launched in July 2012 which included concrete questions on these various points. A final text is due to be released in Q2 2013[33].

In autumn 2011, the European Parliament and EU Council adopted positions in support of protecting net neutrality. The first recognised the risks of departing from the principles of net neutrality and underscored the importance of adopting a consistent approach at the European level, and calling on regulators to monitor neutrality in a concerted fashion. The second, while asserting that there was no clear need to legislate at this time, nevertheless considers neutrality as an overall objective for authorities.

Buoyed by the support of European institutions, BEREC has been working on the issue of neutrality since 2010, with the objective to reach a common understanding of the questions at hand, and to establish a common methodology for addressing them. Four working groups have been created which are devoted, respectively, to traffic management, transparency, quality of service and interconnection. BEREC published its first two reference documents in 2011, setting guidelines for improving transparency, on the one hand, and for assessing quality of service on the other hand. They were followed by three new reports being submitted to consultation in May 2012, whose final adoptions are expected before the end of the year.

30 COM (2011) 222 final
31 N. Kroes blog post: http://blogs.ec.europa.eu/neelie-kroes/netneutrality/ and MEMO/12/389
32 http://ec.europa.eu/information_society/digital-agenda/actions/oit-consultation/index_en.htm
33 At the same time, the Commission is currently working on a recommendation concerning NRAs' notification of minimum quality of service requirements.

The first report, on competition issues related to net neutrality[34], seeks to determine the economic impact of differentiation practices on traffic management used by ISPs on end users and content and application providers. The second report, on IP interconnection[35], provides a snapshot of IP interconnection agreements and their effects on the market. The last report offers quality of service guidelines[36] that suggest a roadmap for an NRA introducing minimum quality of service requirements.

The conclusions of these BEREC reports are summarised in the chapters of the second part of this report.

The European Commission also asked BEREC to conduct a survey on operators' traffic management practices. Its findings, which were released at the same time as the three other reports cited above, highlighted the different traffic management practices used in Europe. Although most operators provide unrestricted access to the Internet, some practices are relatively widespread. The survey revealed, for instance, that at least 20% of mobile Internet users are affected by restrictions on access to Voice over IP (VoIP) services.

1.3.2 Actions in the Member States

With the exception of the Netherlands, none of the EU Member States has adopted restrictive legal provisions for protecting net neutrality.

The Netherlands adopted legal provisions that forbid blocking and throttling, and differentiated billing of Internet applications – subject to four exceptions which are considered reasonable motives, namely non-discriminatory efforts against traffic congestion, security, user consent, and application of the Law or court decisions.

In the other Member States, it is primarily regulators – albeit with varying degrees of intensity – which are engaged in working on this issue. Improving transparency and monitoring quality of service are the questions most commonly addressed.

On this topic, the report[38] presented on 2 May 2012 by MP Laure de La Raudière to the Minister of digital economy, on which ARCEP has collaborated, gives an overview of the debates and actions in Europe. Particularly, it includes the implementation of relevant provisions from the transposition of the "Telecoms Package" and deepens the cases of Germany, the Netherlands and the UK.

34 http://www.berec.europa.eu/files/news/bor_12_31_comp_issues.pdf
35 http://www.berec.europa.eu/files/news/bor_12_33_ip_ic_assessment.pdf
36 http://www.berec.europa.eu/files/news/bor_12_32_guidelines.pdf
37 http://www.berec.europa.eu/eng/document_register/subject_matter/berec/reports/45-berec-findings-on-traffic-management-practices-in-europe
38 http://www.economie.gouv.fr/economie/remise-dun-rapport-sur-mise-oeuvre-des-nouvelles-dispositions-paquet-telecom-europe

TO SUMMARISE

In autumn 2011, the European Parliament and EU Council adopted resolutions in support of protecting net neutrality. BEREC has been working on the issue of neutrality since 2010 and has published important reports in 2012. Its aim is to reach a common understanding of the questions at hand, and to establish a common methodology for addressing them. The work of the European Commission is currently based on these reports. It thus develops recommendations rather than binding legislation. Meanwhile, with the exception of the Netherlands which has adopted legal provisions on net neutrality, Member States are acting chiefly through their national regulatory authorities.

1.4 The situation in France

1.4.1 ARCEP's "ten proposals"

The actions being taken by ARCEP aim at achieving a better understanding of the technical-economic issues of net neutrality, setting clearly the terms of the debates with all of the stakeholders and giving concerted and pragmatic answers to it.

To guarantee compliance with the principle of net neutrality, it is vital that all of the market's competing players are on board – although that alone is not enough. This is why, after a long period of debate and consultation with market stakeholders, in September 2010 ARCEP published ten proposals on Internet and network neutrality[39] which establish a framework for market players' actions. On the whole, these proposals met with a positive reception from the different categories of stakeholders. They concern undertakings that operate the electronic communication networks relaying Internet traffic, but also content and application providers (CAP) and device manufacturers.

The **first four proposals** concern the framework governing ISPs' business, to protect the dynamics and openness of the Internet ecosystem in a lasting fashion, and this on both fixed and mobile networks.

Because Internet access services provide global connectivity to all of the Internet content, users must be able to clearly identify that type of services within ISPs' product line. Applying this principle means that ISPs must provide Internet users, in accordance with the legal provisions in effect, with unrestricted and high quality use of their Internet connection (proposal No. 1), with no discrimination between streams (proposal No. 2). Exceptionally, traffic management practices may be permitted within a framework defined by five criteria (proposal No. 3): relevance, efficiency, proportionality, transparency and non discrimination between parties.

Delivered alongside Internet access services, specialised services supplied by ISPs offering a controlled level of quality – such as IPTV or telephony –enable the development of services with different requirements, and provide rich terrain for innovation. They must be allowed to develop freely, in compliance with existing laws, provided they do not adversely effect the quality of Internet access services (proposal No. 4).

39 The proposals are reproduced in full in Appendix 1.

In the **next four proposals**, ARCEP announces the efforts being put into place to verify compliance with the stated principles, and particularly to ensure that Internet access services are of sufficiently high quality. Transparency needs to be strengthened, to make access products clear to end users and allow for comparison (proposal No. 5); traffic management practices must be clearly stated, monitored and limited (proposal No. 6); quality of service must be measured, based on detailed and monitored parameters, and the results made public (proposal No. 7); lastly, more information is needed on the IP interconnection and routing market (proposal No. 8).

The **last two proposals** pertain to undertakings other than ISPs who are equally concerned by Internet and network neutrality: ARCEP invites public and private sector players to take into consideration the importance of content and application providers (proposal No. 9) and of device manufacturers (proposal No. 10) in the construction of an ecosystem that upholds Internet and network neutrality.

These proposals, which were made public in 2010, are essentially preventive and most serve as recommendations. Some do nevertheless refer to legal obligations that apply to all operators, such as transparency, and all generally serve to frame the debate and, when applicable, the actions to be taken by the technical-economic regulator of Internet networks– namely ARCEP.

1.4.2 New provisions resulting from the transposition of the third Telecoms Package

In 2011, the transposition of European directives from the 3rd Telecoms Package gave ARCEP new responsibilities in the area of Internet and network neutrality. In particular, the Authority is tasked with ensuring "*the ability of end-users to access and distribute information or run applications and services of their choice*" and "*that no discrimination exists, under analogous circumstances, in the relationship between the operators and providers of public online electronic communication services in traffic routing and access to these services*".

ARCEP's powers have also been increased, in particular its power to settle disputes which may now involve not only two operators, but also an operator and a "provider of public online electronic communication services"[40]. The Authority's power to gather information has also been expanded to now include both types of undertaking.

ARCEP may also set minimum quality of service requirements for Internet access services, should this prove necessary.

Lastly, the transposition strengthened operators' transparency obligations, in particular with respect to any traffic management practices they might employ.

These points are addressed in more detail in Appendix 2.

40 Which broadly corresponds to a CAP; see Appendix 4 for more details

1.4.3 The work being done in Parliament

Both the National Assembly and the Senate have been discussing net neutrality since 2010, drawing in particular on the work being done by ARCEP, on hearings held by the Assembly's Internet working group (ARCEP appeared on 19 October 2010) and a symposium hosted by the Senate on 26 October 2010.

The discussions that occurred during the symposium, which can be found in the information report[41] filed with the Office of the President of the Senate on 11 February 2011, concluded with a talk from the Secretary of State for the Digital Economy, stating that there was a place for parliamentary initiative on this issue, and calling for further efforts in this area. Noteworthy among subsequent actions were several proposed laws which addressed either the possibility of including the principle of net neutrality directly in the Law – e.g. the bill introduced by Deputy Christian Paul – or certain elements of the debate – e.g. the proposal from Senator Daniel Marsin on the concept of "unlimited" and usage restrictions built into devices – although none were adopted.

Two National Assembly initiatives come to complete the work done by Parliament.

In April 2011, Deputies Corinne Erhel and Laure de La Raudière submitted a report on net neutrality[42] in which they lay out nine proposals – which largely echo those drafted by ARCEP, while going further on some points, in particular the idea of setting a legal definition of the principle of neutrality as it applies to the Internet.

Summary of the proposals contained in the National Assembly Economic Affairs Commission's information report on net neutrality (delivered by Corinne Erhel and Laure de La Raudière)

The first recommendation is to set net neutrality as a policy objective by establishing a legal definition of neutrality (proposal No. 1) and giving the regulator the power to impose obligations to promote it (proposal No. 2).

The second recommendation aims to set strict obligations on blocking websites, investigating the justifications for legal blocking measures (proposal No. 3) and suggesting that a single procedure requiring a court ruling be established (proposal No. 4).

The third recommendation is aimed at protecting universality and guaranteeing the quality of the Internet, confining the use of the term "Internet access" to only those offers that comply with the principle of neutrality (proposal No. 5) and recommending that ARCEP create an observatory for monitoring the quality of Internet services (proposal No. 6). Here, the Authority is responsible for guaranteeing access to a sufficiently high quality Internet – in particular by defining *ex ante* characteristics (proposal No. 7).

The fourth recommendation addresses the topic of lasting financing for the Internet, calling for documentation on the economic stakes surrounding **the** Internet (proposal No. 8), along with an in-depth assessment of the introduction of IP data termination at the European level (proposal No. 9).

41 http://www.senat.fr/notice-rapport/2010/r10-302-notice.html
42 http://www.assemblee-nationale.fr/13/rap-info/i3336.asp

More recently, Laure de La Raudière submitted a report[43] on 2 May 2012 to the Minister responsible for the Digital Economy on the status of current debates and actions being taken in Europe – notably on the implementation of the relevant provisions resulting from the transposition of the Telecoms Package.

The report reveals the significant efforts being devoted to the issue in Europe, and underlines the need for public authorities to take a proactive stance for net neutrality to be guaranteed. Noting that this is a complex topic, the report calls for a preventive and in-depth approach, which must be as homogeneous as possible across Europe. Here, the report qualifies ARCEP's actions as indispensable, and asks that they continue. It recommends that ARCEP be given increased powers to supervise measurement of the quality of Internet access service more closely.

TO SUMMARISE

Back in 2009, ARCEP began a process of discussion and consultation on net neutrality which resulted in the publication of 10 proposals and recommendations in September 2010. Today, ARCEP continues to work on four core issues identified in 2010: transparency, traffic management, quality of service and interconnection. First decisions occurred in 2012. With the transposition of the 3rd Telecoms Package, ARCEP was assigned new responsibilities and new powers. Major efforts have been devoted to the issue, both the in the National Assembly and the Senate.

43 http://www.economie.gouv.fr/economie/remise-dun-rapport-sur-mise-oeuvre-des-nouvelles-dispositions-paquet-telecom-europe

2. ARCEP's work and actions since September 2010

The primary guarantor of neutrality is a dynamic market sustained by fair competition that ensures that the needs of users are matched as well as possible by ISPs products. But market forces alone are not always enough and targeted action may be required in some instances. As a result, the regulator needs to develop analysis and suitable tools for monitoring the market and taking action.

The core technical-economic issues attached to net neutrality are therefore the four work streams that ARCEP has been conducting since publishing its proposals in September 2010:

- **Competition and transparency** (section 2.1) are the regulator's primary tools for promoting the development of high quality Internet access products that satisfy the principle of neutrality. ARCEP co-chairs a working group of public and private sector undertakings that was created in 2012 and whose aim is to improve the conditions of this transparency.
- **Quality of service** (section 2.2) must be sufficiently high for end users. ARCEP is implementing a process for monitoring it (ARCEP decision due to be issued by the end of 2012) which will complement the existing annual survey of mobile networks.
- **Traffic management** (section 2.3) allows operators to differentiate between streams being relayed over their networks. The aim of these practices can vary widely and ARCEP has established a framework for determining which are acceptable, in addition to inventorying and analysing them. An inventory of traffic management practices was performed in January 2012, and will soon be completed by a process of monitoring as part of quality of service surveys.
- **Interconnection** (section 2.4) refers to the relationships between the Internet's core players. Its economics are changing at a tremendous pace and require particularly close supervision. This is why ARCEP published a decision in March 2012 on the periodical gathering of information on interconnection.

Players on either end of the value chain – namely device manufacturers and content and application providers (section 2.5) – need to do their part to protect net neutrality. ARCEP recommends that their particular role in the equation be taken into account.

2.1 Competition and transparency

2.1.1. Challenges

Competition plays a vital role in guaranteeing net neutrality: the greater the pressure created by competing, high quality access products, the less incentive an ISP will have to diminish the quality of its own services. In accordance with the European framework, ARCEP works to stimulate the competitive dynamics in the retail market by regulating the wholesale market when necessary. This means that, in the particular case of France Telecom's copper local loop which underpins xDSL solutions, obligations were imposed on the incumbent carrier to ensure that alternative operators could compete effectively with France Telecom, and sell innovative and competitive products in the retail market. Decisions related to ultrafast optical fibre networks – e.g. making civil engineering available, sharing access networks – have the same objective, as do the terms governing the award of spectrum in the 800 MHz and 2.6 GHz bands to be used by ultra high-speed mobile systems.

For competition to fully achieve its role of disciplining operators' behaviour, the market also needs to be sufficiently fluid and transparent so that users are able to identify the product best suited to their needs and, if necessary, to switch operators.

It is crucial that Internet access products be transparent so that electronic communication service users can make an informed choice between available offers, and so take full advantage of competition in the marketplace. In the case of Internet access, transparency allows users, in particular, to identify those offers that provide access to all of the services and applications available on the Internet, as well as any possible limitations applied to the connection.

2.1.2. BEREC approach

BEREC guidelines on transparency in the context of net neutrality, adopted in December 2011 after having received 80 contributions during the public consultation, emphasize the role of national regulatory authorities to ensure that end-users benefit from an effective transparency. In this context, they analyze several approaches and tools available to reach this goal, and especially emphasize the importance of understandability and comparability of information, which requires a common frame of reference and user involvement.

Important aspects highlighted in the guidelines are:

- The categories of information to be provided: the conditions of service (e.g. average speeds expected), the overall limitations (e.g. data caps) and specific limitations (differentiated traffic management practices);
- The entities which should provide this information: in addition to the obligations imposed on ISPs, several types of third parties may be useful sources of information diffusing, e.g. comparison sites;
- How to convey this information: BEREC recommends establishing several levels of information (more or less detailed) and increasing users' ability to understand information thanks to shared concepts.

2.1.3. Background and ARCEP actions

Despite having made significant progress, the current level of transparency in the French market is still lacking. Users are still not being fully informed about certain practices that have a significant impact on the use of their Internet connection. As an extension of the increased transparency obligations imposed on operators following the transposition of the 3rd Telecoms Package, ARCEP currently co-chairs a working group with DGCIS[44] and DGCCRF[45] whose members include ISPs and consumer representatives, and whose purpose is to determine methods for improving transparency in these areas. A framework will be established for informing users of the specific features of their Internet access service, in the most clear and understandable way possible.[43]

2.1.4. Outlook

In particular, the working group described above is drawing on the initial findings of the work carried out by the National consumer advisory (*Conseil national de la consommation*) on the mobile Internet[46] and BEREC guidelines on transparency in the scope of net neutrality[47]. The results of this work are due to be released at the end of 2012.

2.2. Quality of service

The net neutrality debate raises questions over the potential development of a "two-speed" Internet on which certain content or applications would be conveyed to end users under poorer conditions than others, due to some being throttled while others are given higher priority on the network, or to differentiated treatment at the interconnection level.

There are several dangers inherent in the development of a two-speed Internet, including the danger of the service provided to end users losing some of its richness, and of diminished innovation. These dangers will nevertheless be slight if end users can access the content and applications of their choice under satisfactory conditions, and if CAPs can roll out new innovative services under good conditions.

So the quality of Internet access service is a central metric in the net neutrality debate, and one that ARCEP underscored in its proposals of September 2010. If it is satisfactory, both for best effort delivery as a whole and for each application, type of content and protocol, the richness and the development of the Internet will not necessarily be threatened by the differentiation measures that are introduced.

44 General directorate for competition, industry and services (Direction générale de la compétitivité, de l'industrie et des services)
45 General directorate for fair trade, consumer affairs and fraud control (Direction générale de la competition, de la consommation et de la répression des fraudes)
46 Two opinions from the National consumer advisory, dated 30 November 2011, on improving consumer understanding of mobile internet services, and on use of the terms "unlimited" and "24/7" to qualify mobile services.
47 http://www.berec.europa.eu/files/document_register/2012/8/bor11_67_transparencyguide.pdf

2.2.1. Challenges

The goal is to monitor the quality of the Internet access service being supplied to end users, at a time when the amount of traffic conveyed over the network is rising, new services are being developed – particularly specialised services – and traffic management practices are being employed.

First, it is important to draw a distinction between operator's or ISP's responsibilities and any exogenous elements that may affect the quality of service for subscribers.

In the case of broadband access supplied over DSL from France Telecom's copper local loop, the quality of service particularly depends on the section of the network between the MDF (Main Distribution Frame, where the DSLAM is located) and the customer's premises. This section depends heavily on the very properties of the copper line (length and diameter), and on any possible exogenous disturbances (electromagnetic interference, the installation on the customer premises etc.). This means that customers' actual connection speed could be well below the ISP's advertised theoretical speed. The customer's line may also experience occasional or recurring interruptions of service. ARCEP works on an ongoing basis with France Telecom and all the alternative operators on steadily improving the operational processes for increasing the reliability of the incumbent's copper local loop.

In addition to potential malfunctions on the local loop, the quality of Internet access depends on the service parameters monitored by the ISP, on the performance of the ISP's network upstream from the local loop and on its interconnection with other operators. So there are several factors that can diminish the quality of the access service that end users receive.

First, with the current surge in traffic, and despite the funds being spent today and due to be spent on upgrades, the networks may not be able to continue conveying data under good conditions. This eventuality could be further aggravated by the development of specialised services that carry a controlled QoS (quality of service), at the expense of best effort Internet access services.

Second, the use of traffic management practices that create a differentiation between Internet traffic streams – and so convey them more or less reliably depending on the type of content, their sender or recipient – could selectively lessen the quality of certain types of traffic.

So there are two distinct dangers of diminished quality:

- a danger of a decrease in the overall quality of the Internet access service due to a scarcity of resources;
- and a danger of selective deterioration of quality if a traffic management practice has a detrimental effect on a specific type of content, service, protocol, application, device, etc.

So the quality of Internet access services needs to be monitored to ensure that any differentiation measures introduced by an operator (specialised services or traffic management practices that comply with the rules laid out in September 2010) do not adversely affect the quality of Internet access below a certain acceptable level. The regulator therefore needs to have the tools for controlling the risk of this occurring.

This type of monitoring process also makes it possible to improve the information available to end users on the performance and quality of operators' products, hence their ability to compare ISPs' services and to make informed choices when selecting an Internet access service. In a competitive and sufficiently transparent retail market, this type of information increases operators' incentive to maintain a sufficiently high level of quality.

2.2.2. BEREC approach

A first report on the quality of service was adopted in late 2011 by BEREC, establishing a common understanding of concepts such as public Internet access services, specialised services, congestion, traffic management and different restrictions or degradations, network performance, and the quality of service itself.

The draft guidelines on the quality of service in the context of net neutrality, put out to public consultation in 2012, focuses on the scope and application of the new power of setting minimum quality of service requirements (article 22.3 of the Universal Service Directive). In it, BEREC identifies two main scenarios that could lead to a "degradation of service" as mentioned in the article of the Directive. These two situations can coexist. BEREC proposes an analytical and practical approach of the European framework, based, first, on a dynamic assessment of the situation to describe possible problems and, secondly, on a determination of the need for a NRA intervention. This determination is based on an assessment of the practices themselves and the corresponding market situation.

The first scenario considers that the Internet access service, as a whole, deteriorates over time. Particularly, it could be negatively impacted by the development of specialised services. Proactive or reactive monitoring measures and comparisons (between national actors, with other countries, etc.) can detect the degradations. The next step is to determine how easy it is for users to find affordable offers of sufficient quality and select them.

The second scenario considers the case of specific degradation (understood in a broad sense, that is to say, including differentiation of commercial origin) of certain applications using the Internet access. To assess whether a practice is reasonable, BEREC identifies questions and key criteria: what is its real purpose? Is this purpose legitimate (e.g. for security and network integrity)? Is the measure "agnostic" in relation to the types of applications and implemented in a proportionate way? The next step is to analyse the practice in the context of the market, including the availability of unrestricted offers.

If the situation requires regulatory intervention, the regulator must then select the tool of the most appropriate framework. The guidelines identify several tools in addition to the one which derives from article 22.3, and note that in all cases, the NRA needs to prove the proportionality of its actions. Finally, in the possible event that minimum quality of service requirements would be set, recommendations are also provided on the form and content of notification to the European Commission.

2.2.3. Background and ARCEP actions

The transposition of the European framework into French Law in 2011 gave ARCEP new powers that allow it to set minimum quality of service requirements (see Appendix 2).

Taking a primarily preventive approach at this stage, and one that complements the existing scheme for mobile networks, ARCEP will be introducing a system for monitoring the quality of fixed Internet access services.

This will allow ARCEP to track the evolution of the quality of Internet access services over time, both from a general perspective – i.e. is best effort delivery robust enough? – and for the risks of deterioration in particular applications and protocols – e.g. is a given protocol being discriminated against and causing a substantial decrease in quality? This close oversight will not necessarily result in ARCEP setting minimum quality of service requirements. It is only in the eventuality of major, prolonged and repeated dysfunctions in the marketplace that such a measure would be considered.

This approach is consistent with the work being done by the European Body of Regulators for Electronic Communications (BEREC) and described above.

This process of monitoring the quality of Internet access services is equally relevant on wireline and wireless networks.

For mobile networks, ARCEP conducts an annual quality of service survey that already includes indicators for Internet access. The Authority also plans on developing a tool for monitoring the traffic management practices on mobile systems. A first study of test measures has just been launched. The results should be available at the end of 2012.

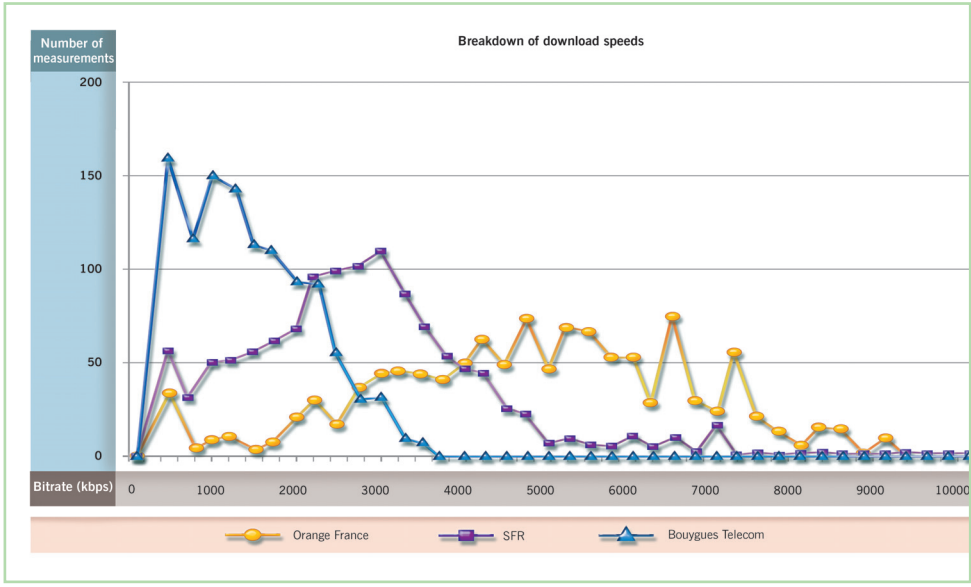


Figure 7. ***Excerpt of the findings from the ARCEP 2011 QoS survey of mobile calling and data services*** [48]

The measurements that have been performed on fixed networks since 2008 on connection and telephone service[49], need to be expanded to include indicators on Internet access. In late December 2011[50] ARCEP held a public consultation to this end, when preparing to introduce a QoS monitoring mechanism for fixed Internet access. The Authority has submitted in June a draft decision to public consultation, and will adopt by the end of 2012 a decision that sets the QoS indicators for Internet access that will be measured and made public – giving precise details on the measurement methods to be used for these new indicators. The first measurements will be performed before the end of 2013. They will provide comparable, representative, objective and clear information for both users and the regulator.

The quality of service indicators that will be measured in application of this decision will cover both the general performance of Internet access services – including the capacity (bandwidth) available to users in real situations, for instance, and how well applications perform on this Internet access service. This means that if traffic management practices are used which differentiate the quality of access given to applications, by blocking or targeted throttling, this difference will be revealed.

48 Breakdown of the bitrates measured for all municipalities with a population of more than 50,000 (explanatory note on the graph: 50 readings were taken of the SFR network, logging connection speeds of between 1 Mbps and 1.2 Mbps) - http://www.arcep.fr/uploads/tx_gspublication/rapport-qualite-service-mobile-2011.pdf

49 Scorecard for the fixed QoS monitoring scheme and results published by operators from July 2010 to June 2011 - http://www.arcep.fr/uploads/tx_gspublication/synth-bilan-qs-fixe-211011.pdf

50 http://www.arcep.fr/uploads/tx_gspublication/consult-qs-acces-internet-fixe-dec2011.pdf

To make it possible to compare the results for the different operators, the measurements will distinguish between access technologies – e.g. short, medium and long xDSL lines, fibre to the home (FTTH), fibre to the last amplifier (FTTLA), etc.

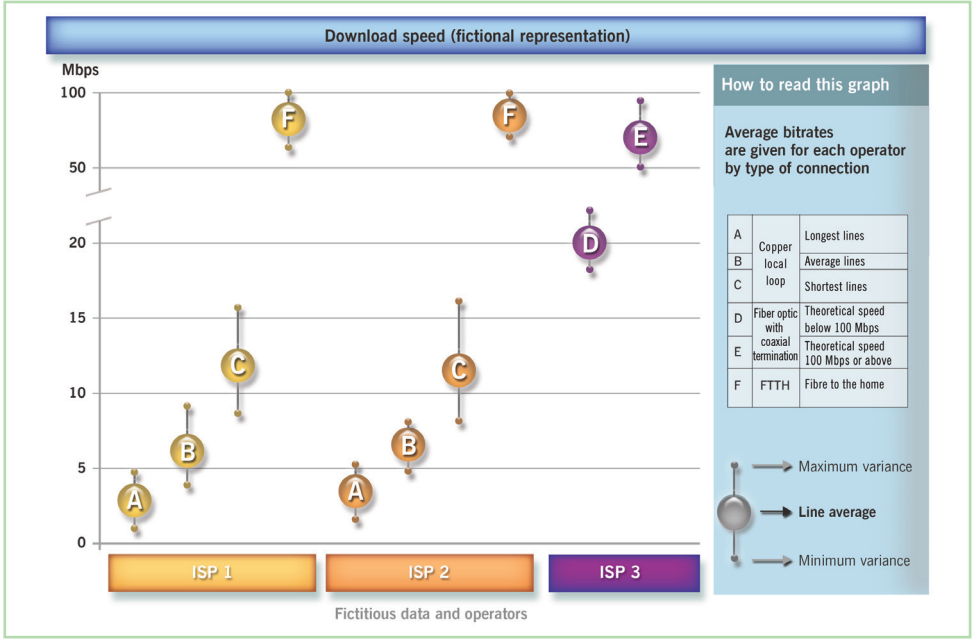


Figure 8. ***Sample representation of the results of QoS measurements for a fixed Internet access service*** *(excerpted from the public consultation of 23 December 2011)*

2.2.4. Outlook

ARCEP will continue to work with stakeholders to implement the system for monitoring quality of service on fixed networks. Here, ARCEP is especially committed to ensuring the relevance, the comparability and the credibility of the measurements. It is therefore important that user associations and independent experts continue to be involved in the process of defining the indicators and measurement methods to be used.

In accordance with the regulatory framework, operators are officially responsible for performing quality of service measurements. Several provisions contained in the document being submitted to consultation are intended to guarantee the accuracy of these measurements. The plan, therefore, is for the main measurements on fixed networks – which will be performed on a select number of locations – to be completed by multiple individual measurements, i.e. tests that volunteer users conduct on their own computer, through an application or a website, for instance.

In their responses to the public consultation, some stakeholders nevertheless expressed concerns over the credibility of measurements – asserting that they should instead be carried out by ARCEP and independently of operators. The Authority is currently unable to fund such a measurement process either on fixed or mobile networks, and the legal framework does not make it possible to demand that operators finance measurements they are not involved in. It is therefore for Parliament to decide whether it would be useful to give ARCEP the legal and financial means to measure quality of service indicators in a more independent way. In her report from May 2012[51], Deputy Laure de La Raudière stated that she considered such a process to be necessary.

TO SUMMARISE

Internet access services must be of sufficiently high quality for the Internet to continue to be a powerful vehicle for innovation and the development of new applications. The ongoing increase in traffic, the development of specialised services and the use of traffic management practices nevertheless have the potential to diminish this quality of service.

In 2012, ARCEP should adopt a decision that specifies QoS indicators for Internet access services on fixed networks, and the methods for measuring them. The first measurements will be performed in 2013, and serve to complement the existing scheme for mobile networks. While preventive in nature, this mechanism will allow the Authority to evaluate whether it is necessary to set minimum quality of service requirements.

To ensure the independence of these measurements and strengthen their credibility with the consumers, a legal evolution could be useful to enable ARCEP to impose to operators a contractor which will perform the QoS measurements at their expense.

51 http://www.economie.gouv.fr/economie/remise-dun-rapport-sur-mise-oeuvre-des-nouvelles-dispositions-paquet-telecom-europe

2.3 Traffic management

2.3.1 Challenges

For operators, traffic management consists of giving differentiated treatment to the traffic travelling over their network – for instance by prioritising certain steams and throttling others, or even by completely blocking certain types of traffic.

At first glance, traffic management and best effort delivery would appear to be opposites. Best effort delivery is closely bound up with the way the Internet has historically been run: there is no guarantee on the quality of how traffic is relayed, in exchange for the certainty that all data streams will be treated as well as possible, with no distinction based on the nature, sender or recipient of these data streams.

Best effort delivery is not, however, contrary to traffic management techniques being employed in a classic network operation business – e.g. when used to guarantee the security or integrity of the network by protecting against attacks. Certain traffic management techniques may, however, be discriminatory, for instance when they seek to block a competitor's content. Generally speaking, the vast array of opportunities for differentiated treatment enabled by recent technologies can raise real concerns.

Traffic management is nevertheless regularly held up as a means both of containing the costs being shouldered by operators, by controlling the volume of traffic, but also of guaranteeing the quality of certain services within Internet access. The opportunity to engage in traffic shaping is especially prevalent for integrated enterprises, such as network operators and content producers/distributors, which could give priority to their own content or that of their business or financial partners – and possibly lower the quality of the services being supplied by the competition.

2.3.2 BEREC approach

The draft report of BEREC on differentiation practices and competition issues related to net neutrality, submitted to public consultation until 31 July 2012, assesses the short and long-term consequences of differentiated traffic management practices (or pricing) on users. It provides a framework for analyzing these practices, and examines three specific situations: blocking of VoIP, throttling of P2P and differentiated offers towards CAPs.

First, the document emphasizes that the competitive impact on the different markets and on innovation depends, in particular, on market power and vertical integration of the ISPs that perform traffic management. In these cases, traffic management can be of economic interest in the short term but may lead to foreclosure. However this foreclosure seems unsustainable if the levels of transparency and switching costs are appropriate. Furthermore, the fact that the ISPs have some control over the choice of content offered to users presents risks on the long term dynamics for innovation and cultural diversity.

Second, the report questions the transition from a model with "no economic relationship" between ISPs and CAPs to a situation of trade negotiations. Considering its effects on social welfare is complicated. However, BEREC highlights the risks of competitive distortion if the ISP differentiation practices can enable CAP discrimination based on non-objective criteria. Therefore BEREC expresses a general preference for "agnostic" practices regarding contents and applications.

Finally, the regulatory tools available and the possible role of NRAs are examined in the third part of the report. In this respect, BEREC emphasizes the essential role of competition, associated with effective transparency, to discipline the ISPs. This approach is centered on the fact that the user changes his offer if he faces a blocking that bothers him. Limitations and uncertainties of this approach are recognized by BEREC. It also mentions the (significant) heterogeneity of users' perceptions and tradeoffs between switching costs, valuation of content and network effects. These points can discourage a user to change his offer even if he or other users would benefit from it. In the case a competitive market would not provide enough offers to users, BEREC states that the following tools can be used to address most of the situations: asymmetric regulation (Article 7 of the Framework Directive), symmetric regulation (Article 5 of the Access Directive), setting minimum quality of service requirements (Article 22.3 of the Universal Service Directive) and dispute resolution (depending on the kind of CAP).

2.3.3 Background and ARCEP actions

In its proposals of September 2010, ARCEP set the framework for what it considered permissible traffic management practices.

ARCEP has considered that investment in networks, if viable and sustainable, should be the main solution to congestion. If palliative practices as traffic management should be considered, the aim must be to share the capacity among end users in conditions as equitable and efficient as possible. This can delay some investments and preserve a good quality of service, but it may not permanently prevent the operator from increasing the capacity of its network.

With regard to the differential treatment of traffic flows in the Internet access, a great variety of practices exist which are not always clearly separated. For instance, the difference can be very thin between the prevention of saturation by the throttling of some flows and the degradation of quality of competing services, or between the limitation of practices considered ineffective by the ISP and the protection of their own services, or between a guaranteed quality of service and the opportunistic benefit of a limited bandwidth. Thus, ARCEP considers it useful to control traffic management practices applied to Internet access. However, it would be difficult, and probably not relevant to define *a priori* the conditions of an "acceptable" traffic management practice or even prohibit traffic management by ISPs. It is therefore appropriate to favour an assessment in each case, on the basis of cross-cutting principles.

ARCEP has thus began by making a distinction between Internet access services where the principle of neutrality must be upheld, and specialised services supplied with a controlled quality of service – such as IPTV or telephony services supplied by a fixed ISP – and for which traffic management techniques used to ensure this QoS are legitimate, under certain conditions.

As regards Internet access services, the overarching rule is open access and no discrimination between traffic streams. The Authority nevertheless defined five criteria that apply to all traffic management practices that depart from these two rules: i.e. they must be relevant, efficient, proportionate, transparent and not create discrimination between players.

While recognising the relevance of some of the objectives of traffic management – such as preventing traffic congestion and ensuring network security – these five criteria serve to underscore the need for any such practices to match their purpose exactly (relevance, efficiency, proportionality), to reiterate the legal

obligation of transparency imposed on all of these practices, and to warn against employing mechanisms that would be prejudicial to some players rather than others in a way that is not justified by any objective difference in circumstance.

As to specialised services, they may rely on traffic management techniques that control the level of quality. To protect every player's ability to innovate, ARCEP specified that all electronic communications operators must be able to market specialised services, provided they do not diminish the quality of Internet access below an acceptable level, and provided they comply with competition laws and sector-specific regulation.

In 2010, ARCEP had noted that, "*The principle of neutrality also appears to have been upheld on the whole in France and Europe until recently, without having been an absolute and inviolable rule. This has been particularly true on fixed networks, especially since there have been no major congestion issues on these networks and due to the satisfactory state of competition in the fixed broadband and ultra-fast broadband retail market in France. Visible, major and prolonged disparities between ISPs are in fact commercially difficult to imagine in this situation. The situation in the mobile market is a more contrasted one, and neutrality is not the rule*".

Since then, the Authority has performed several surveys of the techniques being employed by ISPs in France. The latest one, performed in cooperation with other European NRAs as part of a collaborative process with the European Commission, made it possible to obtain a picture of the techniques that operators were using in January 2012[52]. At European level, it has been estimated that at least 20% of mobile Internet users were affected by restriction of voice over IP (blocking or throttling) and at least 36% by restriction on peer-to-peer traffic.

In France, a wide array of techniques can be observed, of which some warrant special remarks. The situation shows signs of improving, especially in the mobile market – at least on the supply side of things, while the situation with users may be much more varied. It is important that these improvements continue.

Main identified practices are discussed below and are analyzed more thoroughly in Appendix 8.

52 http://www.berec.europa.eu/files/document_register/2012/7/BoR12_30_tm-snapshot.pdf

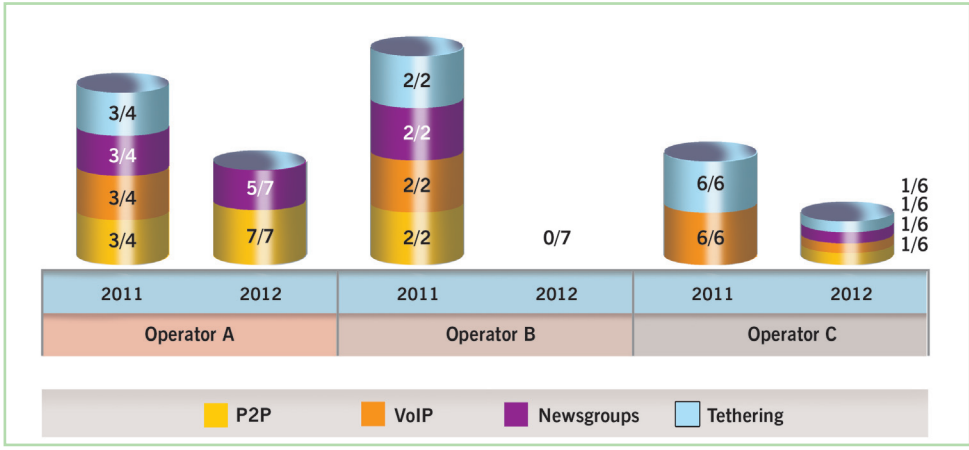


Figure 9. ***Frequency of blocking by France's three main mobile operators in 2011 and 2012.***

The practices taken into account are the four most common types of blocking, i.e. forbidding the use of peer-to-peer file sharing, of VoIP, newsgroups and the use of the tethering function. For each practice, the fraction indicates the number of offers that carry a contractual ban, out of the total number of offers selling Internet access. This survey was performed based on the operators' product catalogue. In some instances, even though the application is not forbidden per se, customers must subscribe to a paid option to access it. For the survey performed in spring 2012, the fraction also includes operators' second brands. The fourth MNO in France, which did not yet exist in 2011, is not included in this graph.

a. General, uniform traffic caps

The survey reveals, first, traffic management practices that throttle (i.e. slow) or block Internet access once a certain amount of traffic has been consumed. Most of these traffic caps – governed by a fair use clause which is common for mobile services and very rare for wireline ones, although several observers believe this could change in future – do not differentiate between traffic streams. Once the customer has reached their traffic allowance, all Internet content and services are throttled or blocked. These practices are not strictly included in the debate on neutrality to which they do not infringe; they are primarily linked to the commercial freedom of operators. Questions do sometimes arise over the consequences of applying traffic caps or tiered billing to fixed line access. ARCEP considers it unlikely that such measures will be introduced in the near future, in a highly competitive and transparent market and provided that, for classic forms of consumption, operators do not have to shoulder traffic costs that increase substantially as traffic increases. Nevertheless, operators have to adjust their offers with the technical and economic conditions of their networks. In this regard, if conditions to encourage a rational consumption were implemented, such general limits would appear preferable to more discriminatory practices, and should, if necessary, be favoured.

b. Differentiated restrictions between applications

Some mobile data plans nevertheless employ a system of traffic caps whereby the use of certain applications – e.g. accessing very popular websites – is not counted in the traffic allowance or is counted separately, which means users can spend more time on these sites/applications than others. ARCEP recognizes the commercial appeal of such offers for ISPs, but underlines the risks of discrimination they create, particularly in how they affect the development of currently less well-known players. This type of Internet access offer often favours one player over its competitors – e.g. a social networking site, a few messaging services, etc. In general, ARCEP considers that ISPs should market Internet access offers that do not favour certain services. If necessary, ARCEP recommends that they design such a strategy by type of service rather than on individual services and that, under all circumstances, they provide a reasonable response to any CAP who asks that their traffic be treated under equal terms and conditions.

c. Targeted blocking and throttling at the expense of certain applications

On mobile networks in particular, targeted blocking continues to occur: VoIP (voice over IP which allows users to make calls over the Internet), peer-to-peer (P2P) file sharing or newsgroups are still forbidden in a significant number of offers, or accessible only in exchange for extra payment. This practice of blocking, which is particularly questionable, nevertheless appears to be gradually becoming a less common occurrence.

Operators' lightened stance on VoIP involves a change in business model, as some still earn most of their revenue from calling services[53] and can therefore "subsidise" data services. ARCEP recognises that a transitional stage is necessary, but it believes that this stage is coming to an end and is therefore calling for a quick end to this practice.

As to the practice of blocking P2P, mobile operators sometimes argue that it is a necessary step to avoid network congestion, since file sharing consumes a great deal of bandwidth. But this practice often raises the issue of unjustified differentiation between streams, since measures that apply equally to all streams would help control users' consumption. ARCEP has received no proof that would justify the need for treating P2P traffic any differently than other data streams. On the whole, then, this type of blocking is unfounded and unacceptable over the long term.

A few fixed access providers have been known to throttle a small number of their customers' P2P traffic. When implemented, these practices appear to result above all from a choice between cost and quality of service which is motivated by two complementary aims: 1) handling congestion when file sharing strains routing or bandwidth capacities to the point of lessening the quality of service given to other applications and 2) controlling the cost of handling traffic when the ISP uses another operator's wholesale solutions to supply its own customers (which generates variable costs, rather than a fixed expenditure).

53 According to the allocation performed by the operators in the information submitted to the Authority within the framework of the observatory of electronic communications services in Q1 2012, 70% of retail revenues came from mobile voice, 15 % of messages (SMS, MMS) and 15% of the data. It must be emphasized that this distribution is essentially derived from rules used to allocate income from retail offerings that are predominantly flat and multi-services: its meaning must be relativized.

By and large, the Authority considers that, if it is a viable and lasting solution, investing in the networks must be the chief response to traffic congestion problems. ARCEP underscores the fact that targeted throttling has sizeable consequences: it threatens the Internet access product's equal treatment of services, causes prejudice to the use of certain services or protocols, and may constitute discriminatory or even anti-trust behaviour. As a general rule, then, it is unacceptable over the long term and must, in any event, be more transparent.

An economic argument may nonetheless be found in the variable costs of traffic that operators need to assume. In non-unbundled areas, throttling may indeed seek to limit the amount an alternative operator needs to pay the incumbent for bitstream solutions (which consist of renting bandwidth at a price that varies according to traffic). Here, it is worth mentioning that ARCEP recently altered the structure of these rates to lessen the variable portion, which in turn lessens the incentive to engage in such practices. It should nevertheless be said that, even when traffic routing costs are high, traffic management practices that do not distinguish between streams are possible and preferable.

d. Other practices

ARCEP continues to monitor a variety of other practices that have been observed, but does not consider it necessary to strengthen its recommendations at this stage.

Specialised services on wireline networks are often delivered using traffic management techniques that affect the quality of the Internet access service. The transparency of these practices needs to improve, although it is still acceptable for as long as the specialised service is controlled by the concerned user and does not significantly diminish the quality perceived by other users.

For the sake of security, most operators employ blocking techniques that restrict certain uses of the network. These can occasionally have a sizeable impact. Network management is operators' very business, and it necessarily involves a number of initiatives whose purpose is to ensure their network runs smoothly. ARCEP recognises the importance of this issue, and considers that because it is such a complex and sensitive one, it is especially difficult to establish a precise framework for what are considered acceptable practices. The principles that govern traffic management nevertheless apply to all of these practices, regardless of their ultimate objective. Relevance, efficiency and proportionality, as well as non-discrimination against other players – unless they are harming the network – remain rules to which security does not constitute an exception. Lastly, on the matter of transparency, the Authority invites ISPs to describe the limitations they impose on users, in theory, in accordance with the Law. If publishing some of these measures would render them ineffectual, the Authority could tolerate employing broader terms to satisfy the imperative of transparency.

Operators may cut off a user's Internet access, or make it impossible to access certain online content, in accordance with decisions issued through a legally authorised procedure, or by order of the courts or a competent administrative authority. ARCEP reiterates that ISPs are not to take it upon themselves to monitor the legality of the use made of the Internet. Complying with legal obligations, particularly if they allow some leeway on the methods to be employed, do not dispense operators from paying particularly close attention to the secondary, undesired effects of any form of blocking that is not strictly confined to what is necessary. Operators are called on to be as discerning as possible, and apply proportionate measures in response to any orders they receive.

Moreover, if operators allow their customers the option of filtering out certain content – by applying parental controls, for instance – users alone must be the ones to apply the mechanism, by being informed of how it works and being given the ability to remove these filters if they want.

2.3.4 Outlook

ARCEP considers that, in a competitive market, increased transparency will only encourage services that provide open access. The Authority has already observed a general shift in this direction, and plans on encouraging it to continue through its efforts devoted to improving transparency. By regulating the wholesale market, ARCEP is also committed to not creating economic incentives for certain market distortions.

At the same time, the work being done on monitoring the quality of fixed and mobile services, which will take the issues of traffic management into account, are intended to provide both users and the regulator with useful information. This is an essentially preventive approach.

Should progress in the marketplace not suffice, ARCEP now has powers that allow it to implement its recommendations.

When settling a dispute between a CAP and an ISP over the terms of traffic routing, ARCEP may first produce a more detailed analysis of possible discriminatory practices and settle the dispute on a fair and equal basis.

Lastly, if players block sites or applications or, in general, employ traffic management techniques that do not meet the criteria of relevance, efficiency, proportionality, transparency and non-discrimination between players, ARCEP may at some point consider setting minimum quality of service requirements, as provided for in Article L.36-6 of the French Postal and electronic communications code, CPCE, consistent with the approach recommended by BEREC in its guidelines. Such requirements could result in a restrictive framework for traffic management. But the rapid developments observed in today's Internet access market make such a decision from ARCEP unnecessary in the short term.

TO SUMMARISE

In September 2010, ARCEP recommended that traffic management techniques employed by operators, and which depart from the general rule of non-differentiation of treatment between Internet traffic streams, satisfy five overall criteria: relevance, efficiency, proportionality, transparency and non-discrimination between players. Since that time, and thanks in particular to competition, ARCEP has observed a decrease in the use of these techniques – especially on mobile networks. Some existing practices nevertheless appear contrary to the recommendations made in 2010. The Authority is therefore calling once again for an end to application (VoIP, P2P) blocking practices on mobile networks, and continues to monitor them.

In case of non-satisfactory developments, ARCEP would have the competencies to implement its recommendations in a prescriptive manner, through dispute resolution or setting of minimum quality of service requirements.

2.4. Interconnection

Interconnection refers to the technical-economic relationship between operators, or between operators and major content and application providers, for connecting to one another and exchanging traffic. By guaranteeing the global mesh of networks and the ability for all users to communicate with one another, interconnection is the very foundation of the Internet.

2.4.1 Challenges

There are several reasons why efforts being devoted to the protection of net neutrality demand an in-depth analysis of interconnection.

Financing the networks, and a potential increase in the contribution made by undertakings operating upstream from ISPs, namely technical intermediaries and CAPs, raise the issue of possible changes to the technical and financial terms and conditions of the interconnection agreements that govern the exchange of traffic, and the financial streams between the players. These changes can create tensions between the different kinds of market players because of their different interests. They can also create some global concerns.

First, a failure in negotiations between two players connected could result in the degradation or failure of interconnection which could make it partially or entirely impossible for users to access, distribute or use the applications and services of their choice. To date, this extreme situation has only arisen on a few rare occasions[54].

54 For example: in early 2008, Cogent cut off its peer connection with Teliasonera, due to a dispute over the issue of capacity and the location of their interconnection points. Teliasonera found an alternative route to Cogent, transiting via Verizon, Level 3 and AT&T. This route was cut off after a few hours by the IP transit providers who are not paid, since they have peering agreements on either end with Cogent and TeliaSonera. Direct interconnection was ultimately restored after two weeks of interruption, once Cogent and Teliasonera had reached a new agreement.

Interconnection could be used to engage in anti-competitive behaviour towards the source, the destination or the content of the information being conveyed. ARCEP must remain vigilant as regards the possible development of such practices.

Conversely, it should be noted that non-discriminatory conditions of interconnection are not directly linked to the debate on net neutrality since they do not infringe the principles of net neutrality. They are part of a more general issue on the financing of networks and the economic balance between operators and users. Depending on the technical and financial terms applied, interconnection could variously influence the investment in networks (increasing their density, use of new technologies, etc.), the optimisation of volumes of data exchanged or the pace of innovation in services, content and applications.

These issues, since they are related to the development of the networks on which are based the Internet, need to be carefully monitored by the regulator.

2.4.2 BEREC approach

The draft report of BEREC on an assessment of IP-interconnection in the context of net neutrality, submitted to public consultation in May 2012, examines the situation and trends of the markets of data (IP) interconnection on the Internet, to assess their competitive operations and determine whether it is necessary for authorities to intervene. Beyond the descriptive and educational developments, the main conclusions of the draft report are described below.

Even though Article 5 of the Access Directive provides the possibility for NRAs to impose interconnection where needed, the Internet and IP interconnection markets have satisfactorily grown without significant regulatory intervention. Tensions between players have occasionally led to interconnection cuts – causing temporary loss of access to certain destinations – but market forces (particularly under the pressure of retail clients) have managed to quickly restore the situation.

However, BEREC believes that regulators now need to deepen their understanding of the interconnection markets, which are quickly evolving and involve new actors and new types of interconnection relations. It indicates that, according to national circumstances, regulators might take different approaches – in particular, preventive or corrective approaches – which may involve campaigns for gathering information.

BEREC finally calls for caution with any binding measure of regulation whose effects could be potentially harmful.

2.4.3 Background and ARCEP actions

Interconnection – including for data – is subject to the laws that govern electronic communications. In particular, Article L. 34-8 of the French Postal and electronic communications code (CPCE) stipulates that operators are obliged to grant interconnection requests from other undertakings operating networks that are open to the public.

IP interconnection is not regulated *ex ante*, in other words the regulator has neither set requirements that apply to the technical and financial terms of interconnection (symmetrical decision) nor assigned any particular obligation to a possible SMP operator in a given market (asymmetrical decision).

ARCEP can nevertheless be called on at any time to settle a dispute between two operators, or between an operator and a CAP, concerning the terms of their interconnection. The ability to properly exercise this power – which was expanded following the transposition of the European directives of 2009 – supposes a sufficiently high degree of knowledge and understanding of the state of the markets. This is indeed the very purpose of the work being done by ARCEP – namely gathering information, discussions with the sector's stakeholders, talks in several workshops, quantitative analyses, commissioning forward-looking reports from experts, modelling of transport costs, etc. To this end, the Authority's Decision No. 2012-0366 of 29 March 2012 provides for the implementation of periodical campaigns for gathering information on the technical and pricing terms of IP interconnection and routing.

A more detailed presentation of the legal framework can be found in the appendices to this report (cf. Appendix 2).

a. Interconnection in a few figures

The Internet today still reflects a hierarchical organisation inherited from its origins, whereby every user communicating through the network pays for a portion of the path used by the traffic. Current trends in the marketplace and the players' strategies are nevertheless driving changes to this longstanding model, and calling it into question to some degree.

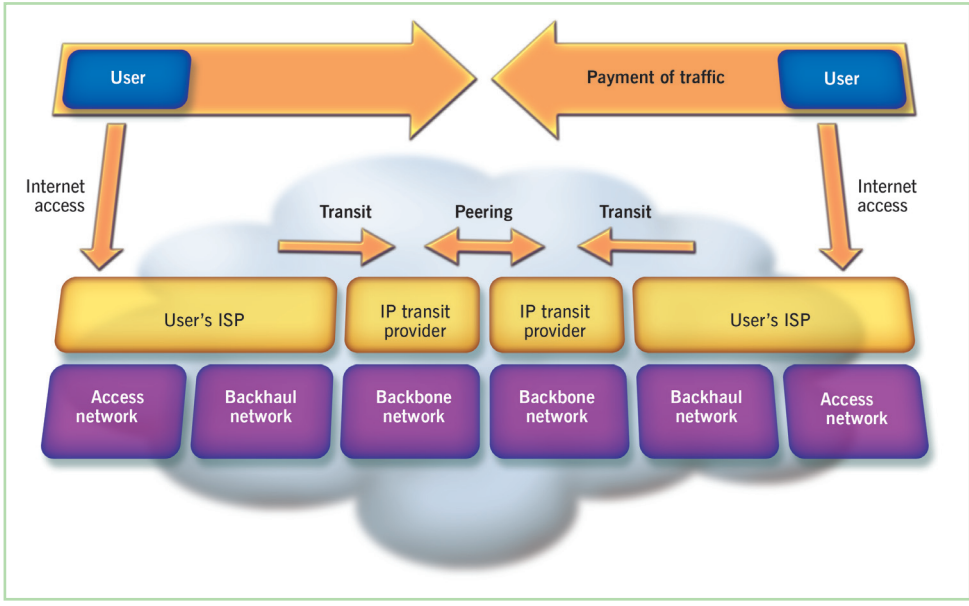


Figure 10. ***Historical hierarchical organisation of interconnection.***

The arrows reflect the financial streams and show how networks are financed from the extremities. There are a number of variations to consider.

The diagram below depicts the current state of IP interconnection in France – the main data traffic and financial streams. The figures correspond to the estimated interconnection capacity between the undertakings and the amounts billed for a full year, based on information gathered informally by ARCEP in 2011.

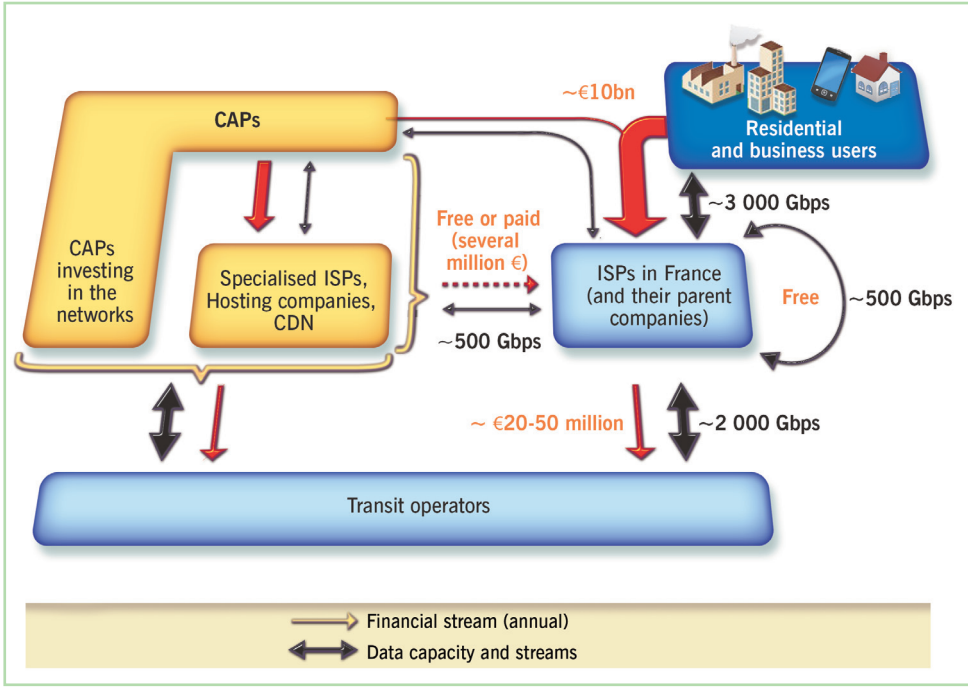


Figure 11. ***Current organisation of Internet players (depiction for France; figures for 2011).***

The financial and data streams between the different types of undertaking are indicated when estimates could be made for the French market.

This overall view reveals the following:

- all CAPs help finance the networks by purchasing Internet access, transit, hosting and CDN services;
- some CAPs even invest in their own network infrastructure to interconnect directly with ISPs or transit operators;
- the majority of traffic relayed to end users in France in 2011 was still via IP transit (around 2/3, including self-supply[55]);
- the financial streams (between operators) in the interconnection market are extremely limited compared to the revenue generated by the supply of Internet access to end users: 0.2% to 0.5% (see also the cost ratios between access, backhaul and global connectivity listed in section 1.2.4).

55 In particular the services supplied by the France Telecom transit network (called Open Transit) and that same group's ISP (Orange).

b. Observed trends

IP interconnection is evolving very rapidly due to the effects of several factors:

- an increase in global traffic due to both a rise in per-user traffic and an increase in the number of users on both fixed and mobile networks;
- a decrease in the price of network equipment, which enable ISPs to cope with the above-mentioned increase in collect and long-haul transport traffic with a constant level of investment on fixed networks (this remark concerns the conveyance of traffic on existing networks, and not the issue of the deployment of next generation access networks);
- the contrast between stagnant revenue in the network layer and a steady rise in revenue in the application layer.

Within this environment, the different types of undertaking are working to optimise their commercial strategy and their positioning on the value chain. Observed behaviours include:

- a strong tendency to diversify, and particularly towards vertical integration, amongst the leading players on the different links along the value chain: CAPs, transit operators, CDN, ISPs and device manufacturers;
- the sector's consolidation, which could ultimately result in a small number of players occupying each link of the value chain;
- CAPs deploying their own infrastructure (own network access, hosting, long-haul transport, CDN);
- emergence and proliferation of interconnection optimisation and load balancing solutions, starting with content delivery networks;
- the development of direct interconnection (peering) between ISPs (at the national and even regional level) and between ISPs and CAPs (only for the largest among them thus far);
- ISP initiatives to create tiered offers and increase their revenue, both in the Internet access retail market and wholesale interconnection markets.

Each of these trends is explored in greater detail later on this report (see Appendix 7).

c. Issues requiring extra attention

Among the trends listed above, there are two that warrant particularly close attention: the rise in vertical integration and the initiatives being taken by the different players to alter the schemes underpinning existing financial relationships. These trends are causing tension between the players and could create risks that need to be analysed. At this stage, however, ARCEP is keen above all to avail itself of tools that will enable it to assess these evolutions and the possible associated risks.

Rise in vertical integration

In all sectors of activity, vertical integration carries inherent risks of abuse when it involves major and especially dominant market players. The electronic communications sector is no exception. Vertical integration concerns all of the links along the value chain (CAP, transit provider, CDN, ISP and device manufacturer) and is developing in both directions – i.e. upstream and downstream on the network.

There are two trends that appear especially widespread: ISPs' diversification into IP transit and the simultaneous activities of operators and CAP.

- *ISPs' diversification into IP transit*

The first trend is rooted in the fact that the bigger ISPs are steadily developing direct interconnection via peering with Tier 1 operators, when expanding their networks beyond national borders. They are starting to market their own transit services and thus to compete – at the very least for their own needs – with the common suppliers of these services.

A good illustration comes from the complaint that transit provider Cogent filed with the Competition Authority. Cogent's complaint concerns the practices of ISP and integrated transit operator France Telecom, and particularly the fact that it had altered the long-standing functioning of the Internet (in particular, the privileged role of IP transit companies) by taking advantage of its integrated operator structure.

In concrete terms, in accordance with its peering policy, France Telecom made the progressive increase of its interconnection capacity with Cogent contingent on financial compensation. Cogent refused to comply with France Telecom's proposed terms, as a result of which interconnection capacity remained insufficient and caused congestion for several years. This situation resulted into degradation (but not complete failure) of access for Cogent's CAP clients when conveying traffic to residential and professional customers of Orange's Internet access offers. From a more general perspective, failed negotiations between two central Internet companies (notably tier 1 operators) would likely result in the Internet's fragmentation if the peer connection between the parties[56] is degraded or cut off. Such an event does occasionally occur but, thankfully, up until now, only for brief periods of time – as was the case in prior instances between Cogent and Level 3 in 2005, and between Cogent and TeliaSonera in 2008.

In the market test begun in the beginning of 2012, the Competition Authority underscored the "*lack of clarity in the relationship between Orange* [ISP division] *and Open Transit* [transit division]*"* and the fact that *"the lack of formalisation of internal trade and exchanges between these two France Telecom entities makes it difficult to monitor any possible price squeezes or even discrimination, which in turn makes it easier to engage in such practices*". France Telecom proposed a set of commitments in response to the competition concerns expressed by the examining parties, whose chief aim was to formalise an internal session protocol between the company's ISP (Orange) and transit (Open Transit) divisions.

- *Simultaneous activities of operator and CAP*

The second trend concerns ISPs' diversification into CAPs' activities and, to a lesser extent, CAPs' diversification into network activities.

Some ISPs can develop their activities in the production and provision of content on the Internet, thus becoming CAP. The mode of delivery of ISP's own content can be questionable, fuelling debates about the risk of proliferation of "walled gardens", that is to say spaces where an operator only offers access to its own content or with conditions significantly better than other competing content.

56 For two tier 1 operators, since by definition they do not use transit, there is usually no other route than their direct connection to convey the traffic between them. The introduction of an alternative route requires that one of the two operators buy transit.

On the contrary, it is in the interest of leading content and application providers that generate massive amounts of data over a sufficiently vast geographical expanse, to deploy their own infrastructure: i.e. hosting centres, backhaul networks, CDN, etc.

A company that is both an ISP and a CAP could be tempted to give preferential treatment to its own content and applications, at the expense of those belonging to third parties. This could involve offering less advantageous interconnection terms to competing CAPs, either directly or through transit operators and CDN via which the content and applications are conveyed.

Under certain conditions, especially in closed approaches, such a strategy of both activities of ISP and CAP can create a risk of impoverishing the range of content and applications available to end users and, over the long term, of dampening innovation. These developments therefore require special attention of the Authority.

It is also worth noting that similar developments of integration between device manufacturers and CAP's activities raise quite similar questions, subjects to developments in section 2.5.

ISPs' stated plans to have CAPs help finance the networks, through the terms governing interconnection

Some ISPs, notably in France, envisage to have CAPs contribute more to financing the networks, either directly or indirectly through technical intermediaries – especially transit operators and CDN. There appear to be two main schemes being examined here: first, monetising interconnection directly – which would involve introducing a solution that is often referred to as "data termination"[57], whereby the ISP charges peering players to convey their traffic over the network to end users – and, second, developing paid, tiered interconnection solutions, alongside standard interconnection offers.

- *Monetising interconnection directly*

Some ISPs are working to introduce a paid component into their peering relationships with content and application providers – and possibly transit operators whose clientele is made up chiefly of CAPs. This component would apply only to the traffic that exceeds the maximum ratio defined in the ISP's peering agreement – e.g. 2:1 or 2.5:1. The fact of exceeding a maximum asymmetry allowance would indeed provide proof of the different nature of the peers or, more specifically, reveal the type of clients that each peer has – in other words mainly CAPs or mainly end users. This asymmetry would justify demanding financial compensation, particularly since the increase in traffic towards end users would be more beneficial to CAPs' business model than ISPs' (whose revenue is affected very little by the increase in traffic under today's most widely used retail pricing schemes).

Paid peering models like this are not new: they have been present for a long time between transit players and have been extended to relationships with ISPs for the last years. For instance, according to several public sources , the peering agreement between transit operators Level 3 and Cogent has included a clause stipulating the financial compensation to be paid beyond a set ratio since 2005. Another example comes from the American ISP and cable company Comcast which is known to have been charging its technical partners for peering for several years.

57 As an analogy with the billing model of call termination for voice communications..

58 See, for instance, http://www.crn.com/news/networking/172901642/cogent-level-3-make-amends.htm;jsessionid=DpfJkvlsthox2TaSUPF7UQ**.ecappj03

The swift development of paid peering beyond the current level seems difficult to achieve. If ISPs are by nature the only players in a position to relay data to their subscribers over their own access network, the countervailing power of their direct commercial partners – i.e. directly interconnected CAPs, transit operators, CDN and other ISPs – remains significant. Because of their size and the control they may have over access to certain content and applications, some of these commercial partners may enjoy a countervailing power as ISP's customers give great importance to the conditions under which they access the content and applications supplied by its partners, and these conditions depend on interconnection with the ISP. As a result, aside from cases where the interconnected partner finds particular value-added – notably in terms of quality of service[59] – in peering, IP transit is likely to constitute a substitute product and its price, which has dropped sharply over the past several years, may be a point of comparison which could reduce the risks of excessive pricing.

Thus, switching from a free to a paid model can nevertheless lead to difficult negotiations between the parties. It can also have real repercussions on interconnection: namely decreasing or capping capacity (e.g. between Free and Google[60] or the case of Cogent vs. France Telecom mentioned earlier) and even having peer connection completely cut off – fortunately only briefly given what is at stake in such extreme cases, as happened when paid peering between Level 3 and Cogent began in 2005.

From an economic perspective, the development of this type of system would likely have consequences that would need to be examined closely.

ISPs' monetisation of their interconnection would result, first, in a clear definition of the price of the service– namely conveying data on the ISP's access and backhaul network. It could serve to inform customers of the value and, indirectly, the cost of data exchanged, and so introduce an economic measure of efficiency. Even though it may be slight, this economic measure could help create an incentive to optimise the traffic being sent (type of encoding, terms and conditions of use for the services, etc.).

This monetisation would also naturally result in an additional charge for CAPs, and so an increase in their Internet connectivity supply costs whose impact, particularly in terms of their ability to innovate with content, services and applications, would be heavily dependent on the prices applied and the type of services involved. Revenue and traffic volume are by no means proportionate for CAPs, and therefore some potentially innovative activities which generate a great deal of traffic may need to alter their business model. So distributing TV/video content, and particularly in high definition, could be affected by the introduction of a system for charging for direct interconnection, whereas other services that consume less bandwidth, such as online shops and social networking sites (aside from photo and video-centric ones), run little risk of any upset. The potential impact would depend directly on the amount that ISPs charge. It could thus be quite small if paid peering charges remained below current transit prices, for instance. Indeed, up until now the transit charges that ISPs and CAPs alike have had to pay have not hindered innovation or the proliferation of content, services and applications – quite the contrary.

59 IThe quality of the peering (direct interconnection) service, as opposed to the quality of the transit service. An ISP's ability to offer interconnection with different QoS levels (SLAs) is addressed in the next section.

60 See, for instance (in French): http://www.numerama.com/magazine/20728-suspecte-de-brider-youtube-free-veut-que-google-investisse-davantage.html

What also needs to be measured is the risk of discrimination between CAPs caused by global paid peering, particularly if, by leveraging their market power, the larger content and application providers managed to avoid the charges imposed on smaller CAPs who are unable to negotiate.

In its proposals in 2010, ARCEP reiterated that interconnection is vital to ensure a "seamless" Internet, and that it needs to be established in an objective and non-discriminatory fashion. Should ISPs develop paid peering offers, they would need to sell them in a transparent and non-discriminatory manner to all other undertakings, whether CAPs, CDNs or transit operators. ARCEP will be careful to ensure that ISPs and CAPs continue to obey this rule. The aim of the work that is currently underway is to enable ARCEP to closely monitor developments in this arena, and to take action if necessary. The information gathering campaigns introduced by the Decision of 29 March 2012 will play an important part in this process.

• *Development of differentiated interconnection tariffs*

Some ISPs want to offer special terms of interconnection, in exchange for payment and governed by bilateral agreements. For instance, the special terms may include:

- delivery to a local/regional peering point[61] ;
- hosting local/regional cache servers;
- ISP itself caching traffic at a local/regional point;
- even offering SLAs on different classes of services, with prioritisation.

The purpose of these new wholesale interconnection solutions is to better segment the CAP clientele, and provide interconnection services of varying levels of quality. Although operators are largely free to negotiate the technical and commercial terms governing the supply of IP interconnection solutions, they are obliged to grant interconnection requests from other undertakings that operate networks open to the public, within the framework provided for by Law.

As stated in the 2010 proposals, interconnection offers must be transparent and non-discriminatory. ARCEP will be particularly careful to these points through its information gathering campaigns.

Moreover, should an ISP employ traffic management techniques downstream from interconnection – such as traffic prioritisation through the creation of a specialised service carrying SLAs, for instance – they need to comply with the framework which is detailed in section 2.3 of this report.

61 Up until now, interconnection between networks has generally occurred at a small number of PoPs at the national level, located relatively far from end users. Some players are planning on interconnecting at points lower down the network that are closer to end users, i.e. regional or local peering points. When interconnecting closer to end-users, a CAP improves the routing performances of its content and application, but also reduces the costs of the partner ISP, therefore the CAP may benefit from better financial terms.

2.4.4. Outlook

Up until now interconnection on the Internet has developed in a quick and lasting fashion, without regulatory intervention. It is vital that this development not be hindered in any way: this is why, given the current situation, ARCEP has no plans for regulatory involvement in the interconnection market.

Some trends are nonetheless causing tension and could be eventually harmful, but ARCEP believes that they do not warrant a more stringent regulatory framework at this stage. It is, however, essential that ARCEP continue to actively monitor the interconnection market, to be able to anticipate potentially harmful developments – and to make informed decisions over any disputes it may be called on to settle – in this rapidly changing competitive landscape.

ARCEP has committed to a process of monitoring interconnection by implementing regular campaigns for gathering information from the stakeholders. Decision No. 2012-0366, adopted on 29 March 2012[62], is aimed at increasing the Authority's knowledge of the technical and pricing terms of interconnection and routing between operators and CAPs that will affect users located in France[63]. Acting as complement to the qualitative and macroscopic analytical work on the state of the market, this information will enable ARCEP to ensure it runs smoothly.

TO SUMMARISE

As a result of rising traffic, decreasing costs and the strategies being employed by stakeholders, the interconnection market is undergoing rapid changes and has become a source of tension between the players. Thus risks of anti-competitive discrimination by some big players may emerge.

ARCEP nevertheless considers that the current state of the market – including the increasing vertical integration of some players and ISPs' efforts to monetise interconnection – does not warrant a more stringent regulatory framework at this stage. Thanks to the Decision adopted on 29 March 2012 on regular campaigns for gathering information from the players, the Authority will be able to monitor market trends, analyse them and take them into account when performing its duties, particularly when settling disputes. The monitoring of the quality of Internet access service will also enable ARCEP to keep an eye on the consequences of these trends on the service provided to the user.

62 http://www.arcep.fr/uploads/tx_gsavis/12-0366.pdf

63 Depending on the conclusions drawn from the first cycle(s) of observation, ARCEP may alter the frequency of the questionnaire, the level of detail or expand its scope in terms of the players required to respond.

2.5 Other questions

Above all, the net neutrality debate raises the question of how much latitude operators have for differentiating the way they treat traffic on their networks. As a result, the focus is chiefly on operators and on ISPs in particular.

But, as the Authority stated in its proposals of September 2010, attention must also be paid to other parts of the value chain. Some undertakings that supply content and applications or devices have undergone tremendous development in recent years, and may control the access to content and applications on the Internet or the browsing between these contents.

Unprecedented issues may arise in these markets which have the potential to undermine neutrality and an open ecosystem. As it is with networks, competition is the prime guarantor of balance in the ecosystem. This means that before considering any other actions, the first concern is ensuring that competition can be properly exercised.

2.5.1 Content and application providers

The Authority had first underscored that users' ability to choose freely from among the content and applications that CAPs make available on the Internet also depends on these providers not discriminating against other operators for access to these content and applications. This appears to be largely the case today, and the Authority is not aware of any particular problems in this area. However, it will maintain its vigilance in this regard, and, following the transposition of the third Telecom Package, operators can now submit to the Authority a request for dispute resolution with a supplier of online public communication services on traffic routing conditions.

Next, ARCEP acknowledged concerns relating to certain dominant players in online search and advertising, in particular Google, and the risks that any abuse of dominant position would be likely to influence the free and open nature of the Internet whose responsibility concern all stakeholders, each at their level. Here, it is worth mentioning the decisions and positions the Competition Authority has issued since that time. In particular, the Competition Authority noted Google's dominant position in this market and was able, when necessary, to impose suitable obligations on the company . The European Commission is also in the process of conducting a survey on this same topic following complaints from competitors accusing Google of manipulating the results of its research services, in particular to promote its own services. According to their statements, they are calling for ending "discrimination and manipulations that transform an open Internet system into a closed Google system". In this context, Google has recently made proposals to the European Commission that could, if necessary, be converted into binding commitments according to the results of discussions between the two entities.

64 See Opinion No. 10-A-29 of 14 December 2010 on competition in online advertising; and Decision No. 10-D-30 of 28 October 2010 on the practices employed in the online advertising sector.

65 See European Commission press release of 30 November 2010: "Antitrust: Commission probes allegations of antitrust violations by Google".

This indicates that the concerns being voiced relate primarily to undertakings that enjoy strong market power, but which are now subject to particularly close oversight by competition authorities who may intervene to prevent, or possibly penalise, abusive behaviour.

2.5.2 Device suppliers

In terms of devices, concerns about breaches of neutrality are particularly related to two aspects.

On the one hand, the ability to use any terminal equipment on any network and on associated competitive issues related to electronic communication services, particularly on operator switching. Practices of exclusive distribution of devices are primarily concerned. The Competition Authority has, in particular, ruled on exclusivity practices implemented by Orange and Apple and ended them[66].

On the other hand, the ability to access any content, applications or services on any device. Increasing concerns are expressed about the role of operating systems of mobile devices, tablets or connected TVs, and the ecosystems more or less open they generate. Control of these environments, located at the end of the chain between the network and the user, enables suppliers of devices or applications which control them to block certain content or applications (like Flash or until recently some browsers in the IOS operating system from Apple), or to control the highlighting of partner content (like the Apple AppStore or platforms of video on demand from certain manufacturers of connected TVs).

66 Decision 10-D-01 of January 11, 2010 concerning the practices used in distribution of IPhone.

Outlook on the connected TV

The connected TV enables multiple changes for each actor involved in the delivery of audio-visual content over IP networks: content publishers, TV channels, "aggregators", broadcasters and ISPs, device manufacturers. TV manufacturers and key Internet players have engaged in this market by developing platforms for connected TV which can be used independently from ISPs' services (platform integrated directly into the TV, Google TV, Apple TV, Sony Qriocity, etc.). This is not without concern for ISPs, who fear large increases of traffic on their networks, without control on it.

Major manufacturers of connected TVs have started partnerships with ISPs (or CAP activities of these ISPs), like the agreement reached in July 6, 2011 between Samsung and Orange. On the latest connected TVs from Samsung, it is thus possible to access via Internet an Orange portal offering information and entertainment services, regardless of the ISP.

Despite the willingness of TV channels to harmonize the distribution of television and Internet content through an industry standard (eg Hybrid Broadcast Broadband TV - HbbTV), Google plans to deploy its services of connected TV on a proprietary technology, based on the operating system "Android", with the aim of creating an environment continuity (in particular via the use of the "search" function) between the Internet service platforms of the various devices on which it is implemented. This proprietary connected TV model requires significant upstream work from publishers to develop their content and applications for the different platforms of "aggregators" like the development of applications on smartphones or tablets.

Thus, TV channels are working to preserve the integrity of their signal (limited display of Internet content) whereas Internet players, especially Google, seem to anticipate an important shift of the television experience.

At this stage it is difficult to predict whether the uses are going to be upset by the generalization of connected TVs. CSA (*Conseil supérieur de l'audiovisuel*) has initiated work on these issues.

Moreover it was also noted that the cost incurred for the consumer, by the switching from a software platform or an application store to another, in terms of migration time or loss of data or applications can limit his mobility, reducing the effects of inter-platform competition.

Following the recommendations of the Authority in September 2010 on net neutrality, and its proposals to improve relations between operators and consumers[67] in February 2011, work has been undertaken by ARCEP, in accordance to proposal No. 12, to "*better appreciate the following practices in markets for fixed and mobile services, their impact on these markets and the remedies which could be taken:*

- *"restrictions that certain device manufacturers or certain electronic communications operators can impose on the use of the device chosen by the consumer, particularly fixed line modems (also called IP boxes) and smartphones, on their chosen network and on all of their functionalities;*
- *"the restrictions that certain device manufacturers may impose on consumers' ability to access the content, service or application of their choice;*
- *"and the difficulties that consumers may encounter in their ability to continue to have access to personal data, configurations, applications, stored media files, etc. when switching digital environment, for instance when switching operators or devices. "*

These different work streams, some of them dealing with issues which go beyond net neutrality, are currently underway.

There have also been Parliamentary debates on this issue. If CPCE Article R.20-22 requires all operators to serve all devices that are compatible with their network, there is not necessarily the guarantee of a reciprocal obligation requiring device manufacturers to allow their hardware to be used on any network. ARCEP and the services of the Ministry responsible for electronic communications brought this issue before the European Commission during the R&TTE (radio and telecommunications terminal equipment) review, but the Commission did not want to amend the directive in this kind. In France, the bill introduced by Senator Marsin, and later the bill on strengthening consumer rights, protection and information proposed additions to the CPCE in this area. The bill proposed creating a new article:

> *"Article L. 34-9-1-2. – Manufacturers of equipment that can be connected to electronic communications networks are forbidden from restricting or blocking the ability to use their equipment to access the network of certain operators of telecommunication networks that are open to the public and which provide the public with electronic communication services, unless this restriction or blocking is requested by State agencies for national security or public safety reasons."*

67 http://www.arcep.fr/uploads/tx_gspublication/propositions-consommateurs-180211.pdf

As a complement, to prevent content or applications being blocked by the device itself, the same bill also provides for increased consumer information on this type of restriction that may apply during the use of certain devices:

> *"Article L. 34-9-1-1. – The suppliers of equipment that can be connected to electronic communication networks must provide the user of the equipment with information on any possible restrictions imposed on their use for accessing electronic communication services sold to the public. This information must specify whether these restrictions differ depending on the operator of the electronic communication network open to the public, or the information society service vendor providing the services. It must also specify whether or not the user will be able to recover or transfer the personal data stored on the device, the rights associated with them, and corresponding rules when applicable, particularly when switching electronic communication service providers."*

The work being done on this subject needs to continue to achieve a detailed diagnosis on the issues surrounding devices, and to determine the appropriate courses of action.

TO SUMMARISE

In addition to Internet access services, the net neutrality debate concerns the practices being employed by CAPs and device manufacturers.

For users to be able to exercise their freedom to choose between the content and applications that CAPs make available via the Internet requires the latter to comply with the principle of not discriminating against other operators for access to their services.

ARCEP has also been devoting efforts to issues surrounding devices, such as the restrictions or access preferences to some contents that can be implemented by operating systems of some devices. There is also some ongoing thinking in Parliament on requiring device manufacturers to ensure that their equipment can be used on any network.

3. Conclusion

To complete this report, ARCEP offers the following conclusions on the different issues identified by Parliament.

Transparency, which is a legal obligation for operators, has increased thanks to actions from the sector's players, which in turn has resulted in greater clarity on some of the restrictions applied to access products. But it is still not enough, and requires concerted efforts between operators and users, as well as real ongoing vigilance from the regulator which has the power to penalise a failure to comply with the obligation of transparency, notably with respect to traffic management practices.

These **traffic management** practices are currently inventoried in both fixed and mobile Internet access markets, through questionnaires that ARCEP sends to stakeholders and will be soon inventoried through active measurements on networks. Some of these practices are contrary to ARCEP's recommendations from 2010, particularly the blocking of specific applications on mobile networks. The increased competition in the marketplace is nevertheless such that it is making these practices increasingly rare. Moreover, the Authority has the tools for accelerating their eradication and, should the need arise, for introducing prescriptive measures to put an end to them entirely. In particular, ARCEP now has increased dispute settlement powers, and the ability to set minimum quality of service requirements.

Quality of service is a crucial, long-term issue. As it stands, it does not appear threatened by the increase in traffic, but it must continue to be monitored to guarantee a sufficiently high quality Internet access service and to strengthen competitive emulation. By the end of 2012, ARCEP will adopt a decision detailing the quality of service (QoS) indicators for Internet access and the methods for measuring and monitoring them on fixed networks. These come to complement the existing monitoring of mobile networks. The first of these recurring measurements will be performed in 2013, and will allow the Authority to react quickly should the quality of service diminish. It will be able not only to disseminate accurate, reliable and transparent information on the quality of the services sold by ISPs, measured in a general fashion – speed, page load time, etc. – but also to identify the traffic management practices being employed on fixed and mobile networks. This will in turn make it possible to deepen users' knowledge and trust, and so allow the market to evolve in a positive way. Here, the question of methods for monitoring quality of service is a vital one. The current regulatory framework – which leaves it up to operators to

perform the measurements themselves, within a framework set by ARCEP – is a first step in the right direction. But it also seems necessary for ARCEP to be able to carry out independent measurements of the quality of Internet access services. This would require a legal provision.

Today's **interconnection** market appears to be both competitive and efficient. It ensures the Internet's global connectivity and guarantees every user's ability to send and access the information of their choice. Fast-growing trends nevertheless demand special attention. The market's most powerful players, and particularly among operators and content and application providers, are gaining tremendous bargaining power which is altering the way the interconnection market has historically been shaped, while technical intermediaries are having to contend with significant pressures. These are evolutions that ARCEP will be monitoring as part of the regular information gathering campaigns that will be implemented pursuant to its Decision of 29 March 2012. Furthermore, if a stakeholder, whether an operator or a CAP, considers itself to be in a particularly difficult or unfair situation, it will be able to appeal to ARCEP whose power to settle disputes was recently expanded. ARCEP considers this system to be adequate and does not, at this stage, plan on introducing *ex ante* regulation.

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The purpose of this report, which was produced in response to a request from Parliament, is to provide the latter with a clear picture of the current state of affairs – where we find improvements but also dangers of deterioration – and of the medium-term outlook. It is up to the legislature to assess what actions to take in response to this report and its recommendations. These actions could take the form of guidelines for the regulator and economic stakeholders, as part of a Parliamentary debate and, if needed, of normative provisions.

The current legal framework does not define the principle of neutrality, and does not demand that economic stakeholders comply with it. With the transposition of the new European framework[58], however, the Law assigns the Minister in charge of electronic communications and the regulator objectives in this area – e.g. users' ability to access and transmit information, lack of discrimination between ISPs and CAPs in the way traffic is conveyed – and gives the regulator increased powers to be able to meet these objectives. Starting with the proposals and recommendations published in September 2010, ARCEP is committed to taking on its new responsibilities in a balanced fashion, and in a way that is consistent with the other responsibilities assigned to it by Law. This will go by way of working towards increased transparency within a competitive market, active supervision of the players, the ability to settle specific disputes, based on previously stated guidelines, and could eventually translate into prescriptive measures should general malfunctions in the marketplace be observed.

In this context, if Parliament should consider it useful to transcribe the guiding principles of net neutrality into Law on a more complete or stricter way, it would nevertheless be wise not to constrict their application through overly-detailed provisions that could prove difficult, if not impossible, to implement in a sector that is in a constant state of technological and economic flux, and which therefore demands that a certain flexibility of action be maintained. In any event, it goes without saying that the regulator will inform the Government and Parliament of any significant developments that cannot be addressed by its existing powers, and which will require new prescriptive provisions.

68 Pursuant to Law No. 2011-302 of 22 March 2011, and to Order No. 2011-1012 of 24 August 2011 and Decrees Nos. 2012-436 of 30 March 2012 and 2012-488 of 13 April 2012..

Appendixes

Appendix 1 ARCEP's ten proposals in September 2010

Below are the ten ARCEP "Proposals and recommendations" that were first published back in September 2010. The complete report is online[69].

1. Neutrality of Internet access networks

1st proposal: Freedom and quality of Internet access

ARCEP recommends that, in accordance with the legislative provisions that are in effect, ISPs marketing Internet access be required to provide end users with:

- the ability to send and receive the content of their choice;
- the ability to use the services and run the applications of their choice;
- the ability to connect the hardware and use the programmes of their choice, provided they do not harm the network;
- a sufficiently high and transparent quality of service.

There may be exceptions to this principle, provided they comply with the guidelines set out in proposed recommendation No. 3.

2nd proposal: Non-discrimination between Internet traffic streams

On the matter of Internet access, ARCEP recommends that, as a general rule, no differentiation be made between the way in which each individual data stream is treated, whether according to the type of content, the service, application, device or the address of the stream's origin or destination. This applies to all points along the network, including interconnection points.

There may be exceptions to this principle, provided they comply with the guidelines set out in proposed recommendation No. 3.

3rd proposal: Supervising Internet traffic management mechanisms

Marking exceptions to the principles stated in proposals nos. 1 and 2, and to limit any possible deviations from these principles, ARCEP recommends that when ISPs do employ traffic management mechanisms for ensuring access to the Internet, that they comply with the general principles of relevance, proportionality, efficiency, non-discrimination between parties and transparency.

69 http://www.arcep.fr/uploads/tx_gspublication/net-neutralite-orientations-sept2010-eng.pdf

4th proposal: Managed [or specialised] services

To maintain all of the players' capacity to innovate, all electronic communications operators must be able to market "managed [or specialised] services" alongside Internet access, to both end users and information society service vendors (ISV) [or content and application providers (CAP)], provided that the managed service does not degrade the quality of Internet access below a certain satisfactory level, and that vendors act in accordance with existing competition laws and sector-specific regulation.

5th proposal: Increased transparency with respect to end users

ISPs must provide end users – in both their sales material and the contractual terms and conditions for their electronic communications services, and in the information that is available to the customers of these offers for the duration of their service contract – with clear, precise and relevant information on:

- the services and applications that can be accessed through these data services,
- their quality of service,
- their possible limitations,
- and any traffic management practices that might affect them.

To this end, ARCEP recommends in particular that:

- principles of freedom of use and non discrimination between the streams, stated in proposals nos. 1 and 2, be stipulated explicitly in the ISP's sales material and contractual clauses, in a clear and understandable fashion;
- the term "Internet" cannot be used to qualify these services if certain of these restrictions do not comply with the demands of proposal No. 3;
- the term "unlimited" cannot be used to describe service offerings that include "fair use" type limitations that result in access being cut off temporarily or extra billing for the services, or an excessive degradation of access speeds or the quality of the service.

The Authority will initially request that ISPs and consumer association representatives work together to define common systems for providing end users with information on the limitations of the offers and their traffic management practices, and to submit their proposals on the matter to ARCEP by the end of Q1 2011.

Subsequently, should it prove necessary, the Authority could work in tandem with the General directorate for fair trade, consumer affairs and fraud control, "DGCCRF" (Direction générale de la concurrence, de la consommation et de la répression des fraudes), to complete these proposals.

6th proposal: Monitoring traffic management practices

ARCEP will ask ISPs and their representative associations, ISVs [or CAPs] and their representative associations, as well as consumer associations to work together to identify and qualify the different types of traffic management practices, including "fair use" limitations associated with so-called "unlimited" offers, and to submit their proposals on the matter to ARCEP by the end of Q1 2011.

In the meantime, the Authority will monitor the evolution of the traffic management practices that operators are employing, in particular to evaluate whether they are complying with the criteria of relevance, proportionality, efficiency, non discrimination between parties and transparency.

Subsequently, should it prove necessary, the Authority could work in tandem with the DGCCRF to complete these proposals.

7th proposal: Monitoring the quality of the Internet access service

To ensure that the quality of the Internet access service is both sufficiently high and transparent, ARCEP will be devoting efforts to:

- define the main Internet access quality of service parameters and establish suitable indicators;
- require ISPs to publish these QoS indicators for their retail data transmission services periodically, particularly for Internet access on both fixed and mobile networks.

This work will be performed in tandem with the DGCCRF, operators and their representative associations, ISVs [or CAPs] and their representative associations, as well as consumer associations.

8th proposal: Monitoring the IP interconnection market

ARCEP recommends:

- that parties providing end users with access to the Internet grant, in an objective and non-discriminatory fashion, all reasonable requests for interconnection whose purpose is to provide these users with access to Internet services or applications;
- that parties providing ISVs [or CAPs] with access to the Internet grant, in an objective and non-discriminatory fashion, all reasonable requests for interconnection whose purpose is to make these ISVs' [or CAPs'] services or applications accessible to Internet users.

To eradicate the opacity that currently exists in data interconnection markets, and to obtain information that will be useful to exercising its powers, the Authority will be adopting a decision on the periodical collection of information on these markets, before the end of Q1 2011.

Based in part on this information, the Authority will later assess whether it is necessary to implement more prescriptive regulatory measures in these markets.

2. Other aspects of neutrality

9th proposal: Taking account of ISVs' [or CAPs'] role in Internet neutrality

ARCEP underscores the fact that users' actual ability to exercise their freedom to choose between offers (services/applications/content) made available by ISVs [or CAPs] over the Internet implies that these vendors comply with:

- a principle of non-discrimination towards the different operators ability to access these offers;
- principles of objectivity and transparency with respect to users, in terms of the rules employed, in cases where the ISV [or CAP] selects and/or ranks content coming from third parties, which is notably the case with search engines.

The Authority invites the private and public parties concerned to take these issues into full consideration.

10th proposal: Increasing the neutrality of devices

As part of the upcoming review of the R&TTE Directive, ARCEP recommends that the opportunity to complete this directive be examined, to take better account of developments in the devices market, particularly the growing importance of the software layers and interactions with ISVs [or CAPs].

The Authority invites the private and public parties concerned to take these issues into full consideration.

Appendix 2 Neutrality in the French Postal and electronic communications code (CPCE)

The Net neutrality debate arose in Europe during the review of the regulatory framework governing electronic communications in the EU, which came at a time when discussions on the topic were already heating up in the United States. The third Telecoms Package, which was adopted in late 2009, reflects various aspects of the debate – e.g. smooth running of the network, development of sustainable business models, users' freedom to access and distribute the content of their choice and to use the applications and services of their choice, freedom of expression, etc. – into a series of provisions that aim to be pragmatic.

Following the transposition of these directives into French Law[70], the affected provisions in the French Postal and electronic communications code (CPCE) now contain net neutrality objectives (1) and assign the tools needed to achieve them (2).

1. Net neutrality objectives covered by the CPCE

Article L. 32-1 of the French Postal and electronic communications code (CPCE), which lays out the overriding objectives of regulation, was completed by provisions relating specifically to net neutrality, following the transposition of EU directives into French Law.

The Code requires ARCEP[71]:

- *"to take, in an objective and transparent manner, measures which are reasonable and proportionate to the stated objectives and [ensure] that no discrimination exists, under analogous circumstances, in the relationship between the operators and providers of public online electronic communication services in traffic routing and access to these services";*
- to ensure *"fair and effective competition between network operators and providers of electronic communication services that benefits users and, to this end, [...] competition over the transmission of content and, when appropriate, promoting infrastructure-based competition"*[73]*;*
- to ensure *"the ability of end users to access and distribute information, and to access the applications and services of their choice"*[73].

70 Order No. 2011-1012 of 24 August 2011, Conseil d'Etat Decree No. 2012-436 of 30 March 2012 and Decree No. 2012-488 of 13 April 2012.
71 As well as the Minister responsible for electronic communications, in accordance with their respective responsibilities.
72 This provision transposes Article 8.2 b of the new Framework directive.
73 This provision transposes Article 8.4 g of the new Framework directive.

2. Tools assigned to the regulator by the CPCE

A certain number of tools that reflect the concerns raised by net neutrality were introduced by the European regulatory framework, and later transposed into national Law. They concern transparency, quality of service and the ability to settle disputes between operators and providers of publicly available online communication services.

Transparency-related tools

The approach to net neutrality in the third Telecoms Package is first and foremost to develop effective competition, combined with increased transparency that allows end users to be fully informed of the quality of service on offer, and of any contractual terms that may restrict their access to or use of certain services or applications.

In accordance with CPCE Article L. 33-1 n): "*providers have an obligation to provide users with the information listed in Article L. 121-83-1 of the Consumer Code*".

CPCE Article D. 98-12 stipulates in particular that the "*information listed in Para. I, item n) of Article L. 33-1 will be presented in a clear, comparable and up-to-date fashion, and made readily accessible*".

The end users of electronic communication services have a right to be informed of the features of the products to which they subscribe. Articles L. 121-83 and L. 121-83-1 of the Consumer Code list electronic communication service providers' obligations with respect to the information that must be made available to consumers, and the information that must appear in their service contracts with users. According to these articles, this concerns particularly:

- *"the services provided, their level of quality and the time needed for their delivery";*
- *"the procedures the provider employs to measure or shape traffic to avoid filling a link to capacity or overfilling a link, and how this will affect the quality of the service";*
- *"restrictions on access to services and their use, and on the use of the terminal equipment supplied"..*

Article L. 121-83, to which article L. 121-83-1 refers, states that these categories of information will be detailed in a joint ministerial decision[74].

Although the provisions of the Consumer code and the CPCE are sufficiently precise to be immediately enforceable, the issuing of this decision could be useful to specify the operators' obligations in terms of contractual information and extra-contractual information, with regards in particular to traffic management practices and to the restrictions on the access to services and to their use.

ARCEP has the power to control the compliance with these obligations, in accordance with CPCE articles L. 33-1 and D. 98-12.

74 This will be a joint decision by the minister responsible for consumers affairs and the minister responsible for electronic communications, which will be taken after receiving an opinion from the National Consumer Council and from ARCEP. A decision has been issued prior to the transposition of the Telecoms Package of 2009, but its purpose is limited to the information related to the quality of service (order of 16 mars 2006 on electronic communications services contracts).

Quality of service-related tools

The new directives gives national regulatory authorities (NRAs) new powers in the area of quality of service.

A new paragraph has been added to CPCE Article L. 36-6, stipulating that: *"the Electronic communications and postal regulatory authority can set minimum quality of service requirements to prevent a degradation of service and the obstruction or slowing of traffic on the network. Before doing so, it will inform the European Commission and the Body of European Regulators for Electronic Communications of the motives for and content of these requirements. It will take full account of the European Commission's opinions and recommendations when making its decision."*

This means that ARCEP may set minimum requirements to protect quality of service.

It should nevertheless be said that if such a decision is adopted, it would need to be justified by dysfunctions in the marketplace that have been brought to ARCEP's attention, and would be put into effect after informing the Commission[75].

A system for monitoring quality of service can be put into place to improve the information available to users and to the regulator. CPCE Article D. 98-4[76] stipulates that: *"Operators will measure the quality of service indicators defined by the Electronic communications and postal regulatory authority, under the terms set out in Article L. 36-6. ARCEP can request certification of the methods used to measure quality of service. The rules for making the results of these measurements available to the public will be set by the Electronic communications and postal regulatory authority under the same conditions."*

This means that ARCEP has the ability to define the quality of service indicators that operators will need to provide. It can specify the rules for making the results of these measurements available to the public, through a decision issued in accordance with CPCE Article L. 36-6, and can also now ask that the methods used to measure the quality of service be certified by a third party.

It should nonetheless be mentioned that, although ARCEP can demand that operators measure indicators on the quality of Internet access services, and provide certification, it does not have the power to impose the choice of a common undertaking to perform these measurements, or of a certification body, both of which would be paid for by the operators. For the Authority to have such powers, a legal provision to this effect would need to be adopted.

75 Reminder: recital 34 of the EU Universal service directive stipulates that: "National regulatory authorities should be empowered to take action to address degradation of service, including the hindering or slowing down of traffic, to the detriment of consumers. However, since inconsistent remedies can impair the functioning of the internal market, the Commission should assess any requirements intended to be set by national regulatory authorities for possible regulatory intervention across the Community and, if necessary, issue comments or recommendations in order to achieve consistent application".

76 Which transposes Article 22.3 of the Universal service directive

ARCEP's new powers to settle disputes and gather information

Under the terms of CPCE Article L.36-8, ARCEP has the power to settle disputes between operators over access or interconnection issues. This means that it may be called on to resolve differences that have arisen between operators, stemming from a dispute over an IP interconnection relationship between an Internet service provider (ISP) and a transit operator, for instance. It will therefore be ARCEP's responsibility to *"specify fair, technical and financial terms"* to apply.[77]

The changes brought to Article L. 36-8 as a result of transposed provisions[78] expand ARCEP's powers in this area. This means that, in response to a request from one of the parties, the Authority can now settle a dispute between an operator and an "*undertaking providing public online electronic communications services*[79]" when the dispute concerns "*reciprocal technical and pricing terms and conditions governing traffic routing*" between these two parties.

Although the meaning of "*traffic routing*" could be specified by ARCEP in its decisions, its powers do not extend to content-related issues as such. As a result, any issues tied to exclusivity agreements or content distribution are outside the scope of Para. II of CPCE Article L. 36-8.

To draw inferences from ARCEP's newly-assigned dispute settlement powers, the Order of 24 August 2011 allows ARCEP to gather "*information and documents concerning the technical and pricing terms of traffic routing applied to their services*"[80] not only from operators[81], but also from providers of public online communication services.

This newfound power to gather information can also be employed for work being performed on interconnection and routing.

77 CPCE Article L. 36-8, I.

78 Amendments made to CPCE Article L. 36-8 resulting from the Order of 24 August 2011 come from a combined reading of the new provisions contained in Article 20 of the Framework directive, concerning dispute settlement, and Article 2 of the Access direction which defines the notion of access.

79 The notion of undertaking providing public online communication services harkens back to that of public online communication services which is defined in Article 1 of Law No. 2004-575, dated 21 June 2004, concerning confidence in the digital economy, or LCEN (Loi pour la confiance dans l'économie numérique), which stipulates that "*public online communication refers to all transmissions of digital data, resulting from an individual request, and which are not private correspondence, through an electronic communication process that enables a reciprocal exchange of information between sender and receiver*". For all practical purposes, the undertakings at issue here are enterprises that supply content on services on the Internet.

80 CPCE Article L. 32-4.

81 Operators are also required to provide ARCEP – either in response to a request or at regular intervals defined by the Authority – with "*all interconnection, access and traffic exchange agreements*" that they have signed (Article D. 98-11).

Appendix 3 Net neutrality and the lawfulness of content

As the Constitutional Council (*Conseil constitutionnel*) states in its Decision No. 2009-580 DC of 10 June 2009, because of its wide development, the Internet has become an essential channel for certain fundamental freedoms, namely the freedom to communicate, freedom of speech, and the freedom to write and print. It is up to lawmakers to reconcile these freedoms, which involves ensuring the public's freedom to access online communication services along with fundamental rights, such as property and privacy protection, and public order imperatives, such as the fight against child pornography or against incitement to racial hatred.

Of course the need to reconcile these elements is not specific to public online communication services, and the general rules of law naturally apply here. The development of such a broad array of activities on the network, both commercial and not, has nevertheless led to the introduction of legal and regulatory measures dedicated specifically to this sector, in both France and a number of other countries, using a wide variety of methods[82]. Questions over obligations that may be imposed on operators as a result have fuelled a large debate, and particularly the issue of ISPs' responsibilities with respect to the content they relay.

This necessary balancing act is also a central question being addressed in the cases before the Court of Justice of the European Union (CJEU). It has emerged from CJEU rulings that EU Law requires Member States to achieve a proper balance between intellectual property rights on the one hand and, on the other, freedom of private enterprise, the right to privacy and the freedom to receive or communicate information.

In the Scarlet vs. SABAM case in Belgium, a national court had ordered ISP Scarlet to install a general filtering system that would make it impossible for users to engage in copyright-infringing P2P file sharing of works contained in performing rights society SABAM's catalogue. In its judgement of 24 November 2011[83], the CJEU stated that European Union Law was opposed to such an injunction since the measure did not satisfy the requirement of ensuring a fair balance between the rights and freedoms at issue.

On the other hand, the CJEU recently ruled that a national law which permits rights holders to appeal to the court to require an ISP to communicate a customer's address, corresponding to an IP address, was in keeping with European Law, saying that this legislation, "*enables the national court seized of an application for an order for disclosure of personal data, made by a person who is entitled to act, to weigh the conflicting interests involved, on the basis of the facts of each case and taking due account of the requirements of the principle of proportionality*"[84].

It is vital to draw a distinction between this debate over the obligations that a public authority can impose on operators, and evaluating the measures that operators can put into place of their own accord for technical-economic reasons.

82 Mechanisms for controlling specific content also exist for television/AVM services (see ARCEP's September 2010 proposals).

83 CJEU, 24 November 2011, C-70/10, Scarlet Extended SA v Belgian society of author's composers and publishers of musical works (SABAM).

84 CJEU, 19 April 2012, C-461/10, Bonnier Audio AB e.a.

Only this second aspect is central to net neutrality and the work that ARCEP is doing on the issue. In accordance with the principle stated by ARCEP in its first proposal, every user must be able to access all of the content and functionalities available on the Internet. This principle is therefore closely bound up with "*how important the services have become to participation in democratic life and the expression of ideas and opinions,*" as reiterated it the above-mentioned Constitutional Council decision of 10 June 2009.

To be able to properly consider all of these questions, while clearly distinguishing one from the other, in 2010 ARCEP had indicated that users' right to access the Internet's different functionalities is contingent on "*compliance with existing laws.*" The Authority went on to clarify that:

- end users cannot lay claim to a right to send or receive any content (or use services, applications, hardware or software to this end) which has been qualified as illegal by a competent judiciary or administrative authority, in accordance with a procedure provided for by law;
- an ISP is not entitled to take the initiative to verify the legality of the uses being made of the Internet;
- an ISP must, however, implement the measures provided for by law – which concern network integrity, protection of personal data, the battle against child pornography or protecting intellectual property, for instance – when requested to do so by the competent parties and authorities.

Lastly, ARCEP had noted that the competent authorities must take special care when imposing obligations on operators, to protect users' access to all content other than what is at issue in the injunction.

Appendix 4 The Internet's cast of players

This appendix provides a profile of the Internet's main stakeholders: content and application providers (CAP), Internet hosting companies, transit operators, content delivery networks (CDN), Internet service providers (ISP), residential and business users (Internet users) and device manufacturers.

It should be mentioned that these profiles are intended to be non-exclusive. This means that a given entity may have several functions at once: an individual may be both a CAP and an end user, while an enterprise may, for instance, engage simultaneously in the business of CAP, CDN and ISP.

The stakeholders are generally grouped as follow:

- end users (Internet users) and CAPs in the "users" category, in other words those parties belonging to the "upper layer" of Internet services, where data are exchanged and consumed in the usable form of content, services and applications;
- ISPs, Internet hosting companies, transit operators and CDN in the category of players belonging to the "lower layer" of the Internet networks where data are relayed, in other words switched, transported and routed.

CAP/PPOCS

A content and application provider (CAP) designates, for the purposes of this report, a legal entity or natural person who provides an information society service, in other words any service provided by means of electronic equipment and at the individual request of a service recipient, regardless of the business model employed. In practice, this category of economic actor includes undertakings (publishers, distributors) that provide the public with services, content and applications through electronic channels – particularly but not solely via the Internet (e.g. TV channels delivered over ADSL).

Google, Facebook, Dailymotion and Amazon are among the CAPs whose websites are the most highly trafficked in France.

In 2010, ARCEP had used the term of ISV (information society service vendors), as defined by Directive 2000/31/EC (so-called "e-commerce directive"), to designate the same actors. The current practice in BEREC's works is to use the term "CAP" (content and application provider) to emphasize the distinction between content and applications, on the one hand, and Internet access services and other specialised services, on the other hand, which are provided by "ISP" (Internet service provider) or "IAP" (Internet access provider). It is therefore proposed to use the direct translation "FCA" (*fournisseurs de contenus et d'applications*) in documents in French.

In the report they produced on behalf of ARCEP on the notion of electronic communications operator[85], consulting firms Hogan Lovells and Analysys Mason reached the conclusion that two notions found in

85 Available (in French) on the ARCEP website: http://www.arcep.fr/uploads/tx_gspublication/etude-Hogan-Analysys-juin2011.pdf

French Law come close to the notion of ISV: "*public communication by electronic means*" and "*public online communication*".

Since the Telecoms Package was transposed into national law, the term employed is provider of "*public online communication services*" (PPOCS) – defined by the Law of 21 June 2004 on confidence in the digital economy (Loi pour la confiance dans l'économie numérique, LCEN) as "*all transmissions, upon individual request, of digital data that does not constitute private correspondence, through an electronic communications process enabling the reciprocal exchange of information between the sender and the recipient*".

A CAP is only one type of end user.

Internet hosting company

An Internet hosting company's main business is to make information society services that are designed and managed by third parties available to Internet users. In practical terms, a hosting company's role consists of deploying, operating and making secure (both physically and electronically) storage servers on behalf of its CAP clients. In many instances, a hosting company will also provide Internet connectivity, ensuring its interconnection with other operators. In this case, it is a provider of electronic communication services.

Among the top hosting companies supplying the French market are: Orange, SFR, Completel, OVH, Leaseweb, Iguane Studio, 1&1 Internet, etc.

Transit operator

A transit operator is a provider of electronic communication services[86] whose business includes providing transit solutions. A transit operator allows operators and CAPs who interconnect with it to exchange traffic with all (or part) of the networks that make up the Internet.

Level 3 (which took over its chief competitor, Global Crossing, in April 2011), NTT and Sprint are the top three global transit operators[87]. Verizon, Tata, TeliaSonera, Opentransit (France Telecom), Cogent and Neo Telecoms are also major transit operators which have large commercial contracts with content and application providers and ISPs in France.

86 "Electronic communications service" is defined in Directive 2002/21/EC (Framework directive) as: "a service normally provided for remuneration which consists wholly or mainly in the conveyance of signals on electronic communications networks, including telecommunications services and transmission services in networks used for broadcasting, but exclude services providing, or exercising editorial control over, content transmitted using electronic communications networks and services; it does not include information society services, as defined in Article 1 of Directive 98/34/EC, which do not consist wholly or mainly in the conveyance of signals on electronic communications networks".

87 On its blog, economic research and consulting firm Renesys provides a yearly ranking of the globe's transit operators. This one, as of the end of January 2011: http://www.renesys.com/blog/2011/01/a-bakers-dozen-2010-edition.shtml

CDN

A content delivery network (CDN) is an electronic communication services provider whose business includes optimising the delivery of online data. This optimisation can apply both to network performance (latency, bandwidth, etc.) and routing costs. To achieve this, a CDN operates a fleet of cache servers located close to end users[88], and which store copies of the data to be relayed. As a result, the data in question are relayed only once from their point of origin to the cache server, which helps save on transport/transit costs. It also means that the distance between the server and the end user is shortened, which improves the network's performance. Content delivery networks' main clients are CAPs.

Among the largest CDNs supplying the French market are Akamai, Limelight, Level 3, Amazon Cloudfront, Highwinds, Internap and Yacast.

Some companies, such as Cedexis, perform real-time reporting on their services' performance, and sell these statistics to content and application providers. This information allows a client CAP to modify their routing options to optimise the path taken by its data and services. These actors, who don't own cache servers are sometimes considered, wrongly, as CDNs.

ISP

An Internet service provider (ISP) is a provider of electronic communication services whose business activities include the supply of Internet access products (as defined in the first part of this document).

An ISP's customers can include both content and application providers and end users: residential consumers, businesses, administrations. Physical access to the network can be either fixed – hence the term fixed access – or mobile – hence the terms mobile or wireless Internet access. Unless otherwise mentioned, both types of physical access are considered equally in this report.

Orange, Free, SFR, Bouygues Telecom, Numericable Completel, Virgin Mobile and NRJ Mobile are the leading ISPs in fixed and/or mobile markets in France, the largest among them having deployed their own transmission network. The market is also populated by some 30 smaller ISPs, including Hub Telecom in airports, Outremer Telecom, Digicel and Dauphin Telecom in French overseas markets, etc.

Residential and business users (Internet users)

An Internet user is a legal entity or natural person who employs an Internet access service for their own purposes.

An Internet user belongs to the category of "end users" which the EU Framework directive 2002/21/EC defines as a legal entity or natural person using or requesting a publicly available electronic communications service, but which does not provide public communications networks or publicly available electronic communications services.

88 Particularly with respect to the location of origin/production. Today, cache servers are generally located at the national level, but some players are planning on eventually moving down to the regional and even local (e.g. exchange) level.

The notion of end user goes beyond the scope of the Internet, and covers electronic communications in general. Worth mentioning, too, is that end users can also make various content and applications available on the Internet, which makes them CAPs. Content and application providers are also classified as Internet users.

Device manufacturers

Device manufacturers provide residential and business users equipments that allow them to access the network. Sometimes a distinction is made between IT and telecommunications equipment, but the border is porous and makes relevant the definition of a more general category.

This actors category covers manufacturers of mobile phones and tablets (like Samsung, Apple, LG, Nokia, Archos), computers (such as HP, Lenovo, Dell, Acer, Apple), routers and servers (including Cisco, Huawei, Alcatel-Lucent), excluding, however, from those of the latter, equipment for carrier networks.

It should be noticed that some companies operate both on the devices market and on the content and applications market, either through an integrated firm (thereby Apple sells terminals, controls a platform for applications and provides content and services on the Internet) or by capital links (such as Google, which in addition to its online services, has acquired Motorola Mobility, device manufacturer).

Appendix 5 Cost to ISPs of relaying traffic on fixed networks

Assessing the costs that an ISP has to shoulder to relay traffic over its networks depends on several parameters, of which the main ones are:

- the geographical footprint of the ISP's network (rural, urban, national, regional...);
- the technologies used (FTTH, xDSL, LTE...);
- the degree of control it has over the infrastructure (owner, renting a passive access solution such as unbundling, or an active one, i.e. bitstream...).

More than 92% of fixed broadband and ultra-fast broadband connections in France are based on xDSL technology. In this appendix we assess the costs shouldered by an alternative ISP using this technology. The broadband penetration rate used in these calculations is 67%.

Even when confining itself to xDSL, an ISP's costs will continue to vary a great deal depending on how much control it has over the infrastructure and the location of its customers. So:

- when it relies on unbundling (LLU) to deliver xDSL access, an alternative ISP must ensure provisioning of the transport and backhaul network up to the exchange;
- when it relies on an activated solution such as bitstream, an alternative ISP must ensure provisioning of the transport network up to the delivery point, which is generally located at regional level. Then, when purchasing a bitstream solution from France Telecom, a portion of its costs will depend on the traffic generated by the subscriber and the technology employed.

To plan for the different situations that may occur, we begin by examining the costs shouldered by an alternative operator for:

- the supply of xDSL access using unbundling;
- the supply of xDSL access using one incumbent carrier's activated solution (bitstream).

Next, by establishing hypotheses of a particular operator's technical choices, we can assess its average costs for relaying data traffic on its network. Because this exercise depends heavily on the technological choices made, it cannot be applied in a general fashion to all operators.

To illustrate the impact that the volume of traffic, and so the capacity employed, can have on costs, assessments are conducted based on two hypotheses:

- average consumption during peak traffic times of 100 kbps;
- average consumption during peak traffic times of 300 kbps.

Remark No. 1. What are calculated here are network costs, and not the entire cost of producing an Internet access service (in particular, commercial and after sales service costs are excluded).

Remark No. 2. Average consumption of 100 kbps during peak traffic times corresponds approximately to what we observe today on wireline networks. Using 300 kbps therefore corresponds to a higher than average rate of consumption – which could result from higher than average use of video, for instance. It already illustrates the costs that an ISP will have to shoulder to serve a customer who generates above-

average traffic levels. Given the current rise in usage[89], this second level of 300 kbps may well be reached within the next five years. However, in a projective vision, costs should be adjusted with technical progress (for a given capacity, equipment cost tends to decline over time), which is not done here.

Remark No. 3. The cost assessments presented below are intended above all to illustrate the impact that an increase in the amount of traffic transiting over the network will have on the costs that the ISP has to shoulder. Very different types of costs are involved when assessing unbundling (LLU) vs. bitstream:

- performing a cost assessment for **unbundled connections** includes all of the **recurring costs** *(e.g. monthly LLU charge paid to France Telecom)* and **investment costs** *(e.g.: spending on DSLAM and backhaul networks, service access fees billed by France Telecom)*, of which the latter are amortised over the course of their economic life;
- for **bitstream** connections, the costs that are factored in for network access and backhaul are **recurring charges, service access fees** and the **ultra-fast broadband connection component** (based on the current price of France Telecom's bitstream reference offer).

The costs incurred in the supply of an LLU connection therefore include a larger portion that corresponds to an amortised capital expenditure (CAPEX, rather than operating expenditure or OPEX). This distinction between amortised CAPEX and OPEX is not represented in the graphic below.

Unbundling

Following a public consultation in May and June 2012, ARCEP recently published a regulatory model for unbundled access cost and backhaul cost[90]. This type of tool makes it possible to estimate the cost to an ISP of supplying access in the retail market over unbundled lines.

By drawing the profile of a "generic" operator based on various hypotheses, this tool makes it possible to estimate the costs it will incur – both for the network's access component (unbundling, collocating the DSLAM, etc.) and for the backhaul and core network components. It should be noted that the backhaul component is broken down into two parts: passive backhaul, in this instance using France Telecom's optical fibre link (Lien Fibre Optique) backhaul solution, and activated backhaul equipment installed on all network nodes.

Here, we consider a generic, residential, unbundling operator with a 25% market share, which had unbundled some 3,000 exchanges and whose backhaul network employs only Ethernet technology[91].

89 Annual increase of around 30%, in line with the rise in global Internet traffic. Besides, one operator notes that its customers' average used capacity is already getting close to 200 kbps.

90 Regulatory model for unbundled access cost and backhaul cost, published in September 2012.

91 Remark: this operator profile in no way prejudges the profile that may be employed for regulatory modelling purposes, notably for verifying compliance with pricing obligations resulting from the analysis of market 5 (national wholesale broadband and ultra-fast broadband bitstream solutions) adopted in June 2011.

The model, when used with the previously detailed assumptions, leads to the following results:

- fixed access network costs (copper local loop in this instance) stand at around €13 per subscriber a month (around 90% of network costs). These costs are virtually unaffected by an increase of traffic on the network;
- backhaul and transport network costs represent around €1.5 per subscriber a month, for an average consumption during peak hours around 100 kbps. A part of this cost - corresponding to active equipment - increases when traffic grows. When this average consumption per user rises to 300 kbps, estimated costs increase by €0.15 per user per month.

Remark No. 4. Results coming from the regulatory cost model for unbundled access and backhaul cannot be extended to all operators. The results depend on various parameters, such as the number of MDF, the list of unbundled MDF or the ISP's market share.[92] These results do nonetheless make it possible to illustrate the impact that an increase in traffic will have on the network of an ISP, for the users to whom it provides access through unbundling and the most efficient technologies.

Bitstream

Close to 13% of the xDSL offers sold by alternative operators in the retail market are based on France Telecom's bitstream solution[93]. Consequently, it is assumed below that the generic operator provides Internet access service to 13% of its customers thanks to France Télécom's bitstream solutions.

These regulated wholesale solutions are published in France Telecom's DSL access and backhaul reference offers[94]. The main pricing components of a residential connection – which are included in the offer that came into effect on 15 June 2012 and used hereafter for modelling costs – are as follows:

- access (DSL ACCESS ONLY):
  - service access fees, set at €61 per connection;
  - a monthly fee of €12.55;
- backhaul (DSL COLLECT ETHERNET):
  - a set charge of €4.17 per connection a month;
  - a monthly per-Mbps fee, calculated based on the 95th percentile rule, of €6 per Mbps a month;
- backhaul (DSL COLLECT IP):
  - a set charge of €4.44 per connection a month;
  - a monthly per-Mbps fee, calculated based on the 95th percentile rule, of €12 per Mbps a month;
- backhaul (DSL COLLECT ATM):
  - a monthly fee which is proportionate to the throughput selected by subscriber ISP (€70 per Mbps per month), with a minimum subscription level of 73 kbps per user, which corresponds to an estimate of average throughput per user at peak time.
- ultra-fast broadband connection, at the bitstream lines handover point (4Gbps optical link) :
  - service access fees, set at €7,000;
  - a set monthly fee of €8,025.

92 For instance, if more MDF are unbundled and if the market share decreases, then the costs born by the users will tend to increase.

93 Source: Quarterly observatory of wholesale electronic communications markets (fixed broadband and ultra-fast broadband services) in France. Q1 2012 results, published on 31 May 2012

94 http://www.orange.com/fr/reseaux/documentation/documentation (Offre d'accès et collecte DSL) - in French

It appears that sensitivity of tariff to throughput (whether provisoned or consumed) significantly depends on solutions, and thus technologies, on backhaul network. On first analysis, incremental traffic costs €6 per Mbps with Ethernet technology (DSL COLLECT ETHERNET), €12 per Mbps with IP technology (DSL COLLECT IP) and up to €70 per Mbps with ATM technology (DSL COLLECT ATM).

Ethernet technology, currently the most efficient, will gradually become the most used one, whereas ATM technology should progressively be replaced. DSL COLLECT ETHERNET was recently introduced and, therefore, is not widely used yet. In order to evaluate the costs shouldered by an operator, we assume it uses, for customers served through bitsream, DSL COLLECT ATM for half of them, and DSL COLLECT IP and DSL COLLECT Ethernet for the two remaining quarters.

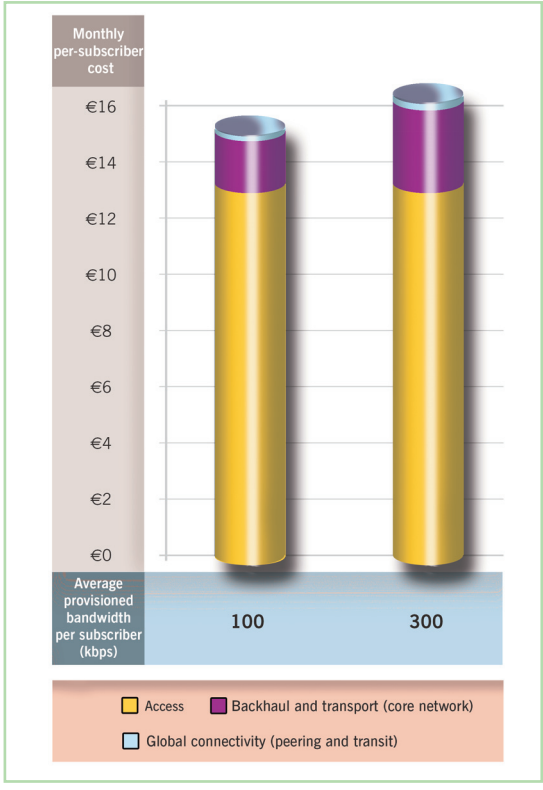

Figure 12. ***Change in monthly cost per subscriber, depending on average consumption for a generic operator (87% of users are served through unbundling; the remaining 13% are served through bitstream).***

Synthesis for a generic alternative operator

Estimated costs for two average consumption profiles at peak hour (100 kbps per user and 300 kbps per user) are shown on the diagram below.

Access

Wireline access network costs (copper local loop) are still around €13 a month, per subscriber, and account for roughly 85% of network costs. They are virtually unaffected by traffic volume.

Backhaul and transport

Backhaul and transport network costs (for an average capacity of 100 kbps per subscriber) today stand at around €2 a month per subscriber. These costs are significantly higher for bitstream access than for LLU access – up to €7.50 a month per subscriber for the "DSL COLLECT ATM" solution – so the average cost depends heavily on the LLU-to-bitstream ratio of the operator in question.

Looking at a scenario of an average capacity per subscriber of 300 kbps, backhaul and transport network costs increase by around €1 to €1.5 a month per subscriber. This estimate also depends heavily on the technical choices the operator has made. This increase would therefore be only €0.6 a month per subscriber for an operator using only the DSL COLLECT ATM[95] solution, but more than €2 a month per subscriber for an operator with 30% of its connections supplied via bitstream[96].

Connectivity

To a first approximation, the cost of national and global connectivity is considered as the transit cost paid by the operator – which has established peering (i.e. settlement-free) agreements with all of the other main ISPs.

Regardless of the technological choices, the costs shouldered by an ISP to ensure its global connectivity are extremely low: around €0.10 a month per wireline customer. These costs, which correspond to transit costs, are proportionate to the capacity employed and therefore increase as average per-customer capacity increases. However, they do not weigh much in the total costs. In addition, they appear unlikely to increase to any significant degree over time since, up until now, the rise in the volume of traffic being exchanged between operators has gone hand in hand with a decrease in transit prices.

95 Given the pricing structure of the DSL COLLECT ATM solution, whose cost to alternative operators increases dramatically as their provisioned capacity increases, this solution will likely be replaced by IP or Ethernet access.

96 Making equal use of all three currently available solutions: i.e. DSL COLLECT ATM, DSL COLLECT IP and DSL COLLECT ETHERNET.

Appendix 6 A detailed look at interconnection

1. Technical aspects of interconnection and routing

Interconnection is the cornerstone of the Internet as it allows all of the networks to communicate with one another. It guarantees – at least technically – that every Internet user has access to the content, applications and services of their choice and, reciprocally, that all content and application providers (CAP) can distribute their products to all Internet users.

For data to be transported from point A to point B on the Internet, it needs to be routed from one autonomous system (AS) to the next, and from router to router within each AS – the router being the basic piece of equipment that steers the data packets over the Internet. Each of these routers is identified by an IP address and belongs to a given autonomous system. Generally speaking, each piece of network equipment and end user connected to an operator's network is identified by an IP address.

For this exchange of traffic to occur, each AS announces the IP prefixes (each IP prefix refers to a set of IP addresses) of the network equipment and end users it services to all of the other AS with which it is physically interconnected. These IP prefixes are then propagated across the entire Internet through a series of successive hops, going from neighbour to neighbour using existing interconnections between AS – provided interconnection rules have been defined between these autonomous systems. This system of announcement and propagation makes it possible to establish the different paths that can be taken to reach the network equipment or the users attached to any IP address. It therefore ensures worldwide Internet connectivity. In other words, the announcement and/or propagation of IP prefixes opens up a third party's ability to send traffic.

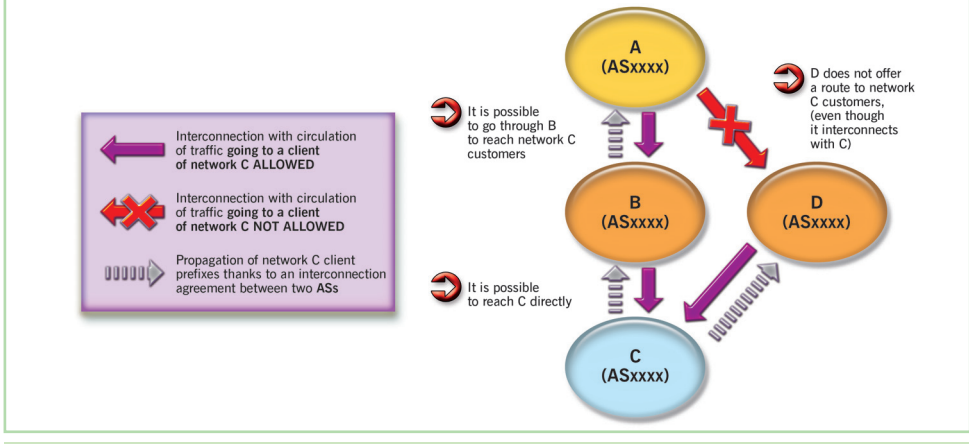

Figure 13. ***The system of IP prefix announcement and propagation***

Any non-propagation of prefixes between two AS can be due to either a technical or an economic choice, and will result in the corresponding routes being either temporarily or permanently blocked.

It is useful to note that on the Internet, contrarily to what prevailed in switched telephone networks, data packets can follow different, dynamically-varying paths. In particular, outward and inward paths for one communication may not be the same.

Here we see the two main forms of interconnection: transit and peering, which are described below.

Transit

Transit is a service whereby an operator (provider) supplies global connectivity to another operator (client) and relays the traffic going to or coming from this client operator, regardless of the traffic's initial origin or final destination – unless there are restrictions bound by an agreement between the parties, in terms of the offer's geographical footprint, for instance[97]. The following diagram illustrates how a transit agreement works.

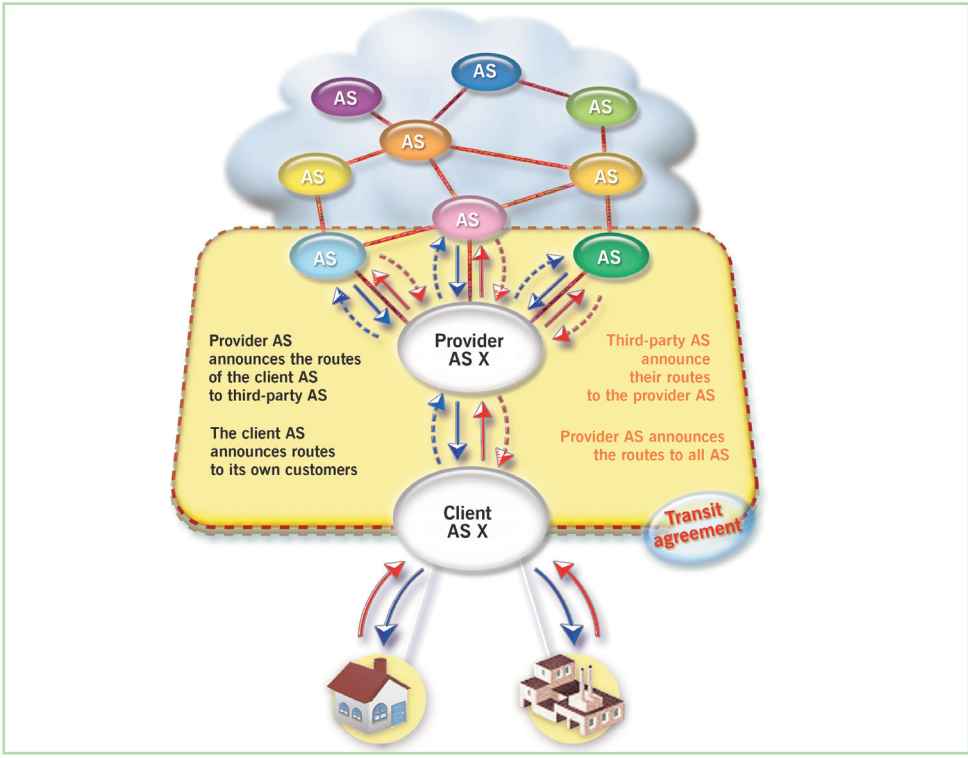

Figure 14. ***How a transit agreement works***

97 This is called partial transit: in other words a service whereby an operator (provider) relays the traffic to or from this client operator, from and to any other point but only if the initial source or ultimate destination of this traffic is located in a predetermined subpart of the networks that make up the Internet. So, although a transit solution, in the generic sense of the term, provides global connectivity, a partial transit solution may, for instance, provide connectivity only to the main French or European operators.

Transit services are generally purchased by small and mid-size ISPs or CAPs that have not developed their own long-haul network, and have not established enough peering agreements (see below) to be able to access the entire Internet.

Connectivity is achieved by having the ISP's IP prefixes propagated via the transit operator, and by transporting the ISP's traffic over its transit operator's network or those of its transit operator's partners. A transit service is generally billed based on capacity (in Mbps, using the 95th percentile rule[98]), and the transit operator will often set a minimum volume, which guarantees it a minimum revenue. The price that transit operators charge for a given volume has been decreasing steadily over time[99], due to a combination of an overall increase in online traffic, the decrease in the unit cost of equipment and competitive pressure.

In the early days of the Internet, transit operators had no contact with Internet users or CAPs, so they provided no Internet access services. They operated a network platform that ISPs connected to, to obtain global connectivity and a long-haul data transport solution. This pure transit operator model is tending to disappear as most transit operators now market Internet access services as well. There are three main types of transit operator in the marketplace, which differ according to their target clientele:

- transit operators that provide Internet access chiefly to CAPs: transporting the traffic generated by these CAPs, these transit operators generally send more traffic (upstream) to their peers then they receive (downstream);
- transit operators that supply Internet access chiefly to Internet users: these are usually ISPs which, in addition to their main business, have also developed a long-haul network and interconnection relationships that allow them to market transit services as well. Because their core business (i.e. Internet service provider) remains important and Internet users are the main consumers of content, these transit operators generally receive more traffic (upstream) from their peers than they send;
- mixed transit operators that provide Internet access to both CAPs and Internet users.

Peering

How it works

Peering is a type of interconnection agreement that allows two operators to exchange the traffic being routed to their own customers directly. Under a peering agreement, the parties do not propagate the prefixes of their other partners or providers, which means the link between them can only be used by the traffic of their own customers[100]. The diagram below illustrates the way a peering agreement works.

98 In other words the maximum rate at which the client will be billed, removing the top 5% of the samples taken.

99 Illustration of the evolution of these prices: http://drpeering.net/white-papers/Internet-Transit-Pricing-Historical-And-Projected.php

100 This means that a third operator which has a peering agreement with one of these two partners will not be able to use the agreement to access the other partner's customers.

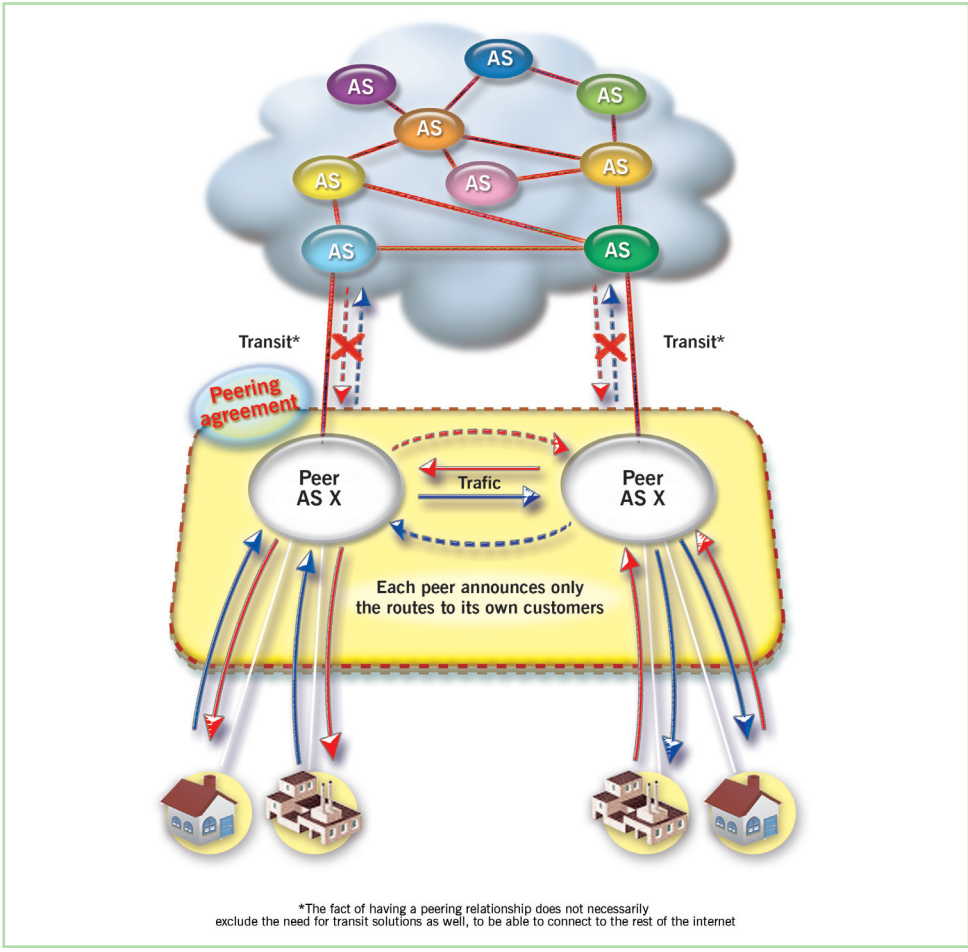

Figure 15. ***How a peering agreement works***

Because peering has traditionally been a mutually beneficial relationship between two operators with similar profiles (hence the term peers), up until now this type of agreement has usually been for free, aside from the cost of installing the switches and lines needed to connect the networks. So global operators – referred to as Tier 1 (see below for details) – have peering agreements with each other, while Tier 2 operators in the same geographical region often have agreements with one another as well. In the traditional scheme of things, the two peers generate a similar amount of traffic and so exchange a balanced ratio of upstream and downstream traffic. To maintain this situation, peering agreements often stipulate that the traffic flowing both ways must remain relatively balanced – setting a limit on the asymmetry, generally capped at a ratio of 2:1.

Most players have defined their own peering practices in the form of a set policy[101] that defines several key parameters: traffic exchange ratios, minimum traffic volume, location of the peering points, etc. In practice, however, most peering agreements are established relatively quickly and informally: the vast majority of them are not based on a written contract but rather a simple agreement in principle between two peers, subject only to compliance with their respective peering policies, if they exist[102].

Although peering agreements are usually for free, the emergence of an imbalance in the interests of the parties involved, or in the traffic being exchanged between two peers has resulted in the development of paid peering, i.e. transit agreements. These agreements are used in particular, although not exclusively, to govern recent direct interconnection agreements between certain large CAPs and certain ISPs (and possibly between ISPs and/or transit operators).

For an operator, paying for transit or establishing peering agreements are two ways to improve connectivity. Transit provides global connectivity – or regional under a partial transit agreement – but induces costs that vary according to the volume of traffic exchanged. Once the connection has been established, peering with another operator makes it possible to exchange traffic with that operator's customers under preferred conditions, and usually with each operator's only bearing its own fixed costs of setting the interconnection. Whether an undertaking pays for a transit service or establishes a peering agreement to exchange traffic with another operator's customers, will therefore depend both on the undertaking's negotiating power and technical-economic considerations, such as the cost of the different options and quality of service[103].

Exchange points

Peering (direct interconnection between AS) can be physically performed:

- on one of the peer's premises;
- at an exchange point (or IX[104]): an exchange point is a site dedicated to interconnection which can be either carrier neutral or managed by a specific operator (carrier specific).

Exchange points allow the parties to sharing hosting and connection costs, in addition to providing an efficient system for managing a great many peering and transit relationships. Being present at an Internet exchange point allows an undertaking to interconnect with all the other AS that are present at this exchange point – provided, of course, an agreement exists between the parties (which is often secured through a fast and verbal process).

The largest Internet exchange points in Europe are located in Frankfurt (DE-CIX), Amsterdam (AMS-IX) and London (LINX).

101 See, for instance:
- http://vision.opentransit.net/docs/peering_policy/ (France Télécom)
- http://peering.gaoland.net/Docs/Peering_SFR_V7fr.pdf (SFR)
- http://www.verizonbusiness.com/terms/peering/ (Verizon Business).

102 Around 99.5% of all peering agreements are not formally set out in writing (source: Packet Clearing House, *Survey of Characteristics of Internet Carrier Interconnection Agreements*, Bill Woodcock & Vijay Adhikari, based on a survey of 142,210 peering agreements).

103 Quality of service is higher when a direct interconnection relationship exists between two parties, as it reduces the number of hops and the distance travelled between the CAP and the end user.

104 The most commonly used acronyms are IX (or IXP) for Internet eXchange (Point) and NAP for Network Access Point.

France has around 15 exchange points, which are modest in size by comparison. Worthy of mention, nevertheless, is the France-IX neutral exchange point which was created to federate the country's many smaller existing IX, and on which traffic has regularly exceeded 100 Gbps at peak times since the start of 2012[105]. While still well below the amount of traffic exchanged on DE-CIX, AMS-IX or LINX, if its current rate of increase were to continue, it could quickly overtake all the other Internet exchanges in France, and eventually become a credible rival for the three main IX in Europe, in Germany, the Netherlands and the UK.

Public and private peering

There are two main types of peering, both of which can take place equally in the physical locations cited above:

- bilateral mode, also called private peering;
- and multilateral, also known as public peering.

Private peering is generally employed when the interconnection capacity between the two peers is large enough to make a dedicated interconnection viable. It may also offer advantages in terms of maintenance and interconnection security.

Public peering was developed to make direct interconnection for smaller volumes of traffic economically viable, by having several peers share interconnection capacities by pooling switching equipment.

2. The Internet hierarchy

Internet players are generally classified into three groups, according to the nature of their interconnection relationships.

Tier 1 operators are undertakings that have built long-haul networks that are directly interconnected with other global, major operators. Although there is no absolute consensus on the definition of each tier in the hierarchy, it is possible to define Tier 1 networks as "*those networks that don't pay any other network for transit yet still can reach all networks connected to the Internet*"[106]. These operators are therefore referred to as "*transit free*". To ensure global connectivity, Tier 1 operators need to all be connected to one another through peering agreements. It is thanks to these peering agreements that Tier 1 operators are able to supply transit services to operators lower down the hierarchy. According to a more restrictive definition, a Tier 1 operator must not only be transit free, but also not have to pay for peering to achieve worldwide connectivity. Depending on the definition chosen, then, there are between 10 and 20 Tier 1 operators in the world today.

Tier 2 operators are mid-size undertakings. They have peering agreements with other Tier 2 operators in their geographical area, but need to purchase transit services from other undertaking – usually but not necessarily Tier 1 operators – to achieve worldwide connectivity.

105 Real time traffic stats for France-IX are available at: https://www.franceix.net/page.php?MP=editorial&ST=section&op=page&artid=48

106 Source: *How the net works: an introduction to peering and transit*, Rudolph van der Berg, 2008.

Last are Tier 3 operators which are smaller and rely entirely on transit services for their connectivity. They are therefore referred to as "transit only" as they have no peering agreements with any other operator.

Tier 2 and 3 operators, which use transit to connect to the whole of the Internet, can chose to use only a single transit operator, in which case they are referred to as "single homed", or several transit operators, in which case they are referred to "multi-homed".

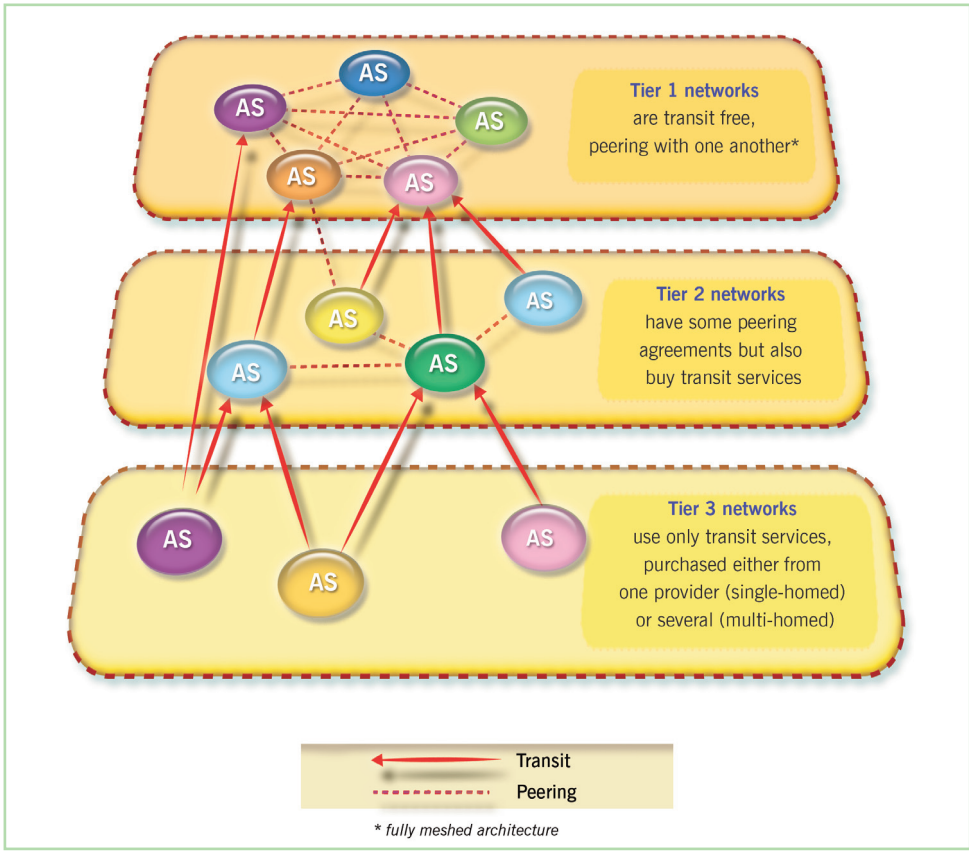

Figure 16. ***The Internet hierarchy***

When building their business, operators may seek to move up the hierarchy. So a Tier 3 operator is initially too small for any other operator to be interested in peering with it, as a result of which it is obliged to obtain its connectivity entirely through transit. As it grows, however, it will achieve a critical mass that will allow it to secure its first peering agreements with Tier 2 operators, and so become a Tier 2 operator itself. It will

then develop its mesh of peering agreements with other peers. A second stage of development occurs when the Tier 2 operator has an opportunity to establish a peering agreement with a Tier 1 operator – which enables it not only to benefit from real savings on its transit costs, but also gives it the ability to enter into a peering relationship with other Tier 1 operators. Finally, a Tier 2 operator that has established peering agreements with enough other players – including at least several Tier 1 operators – is then in a position to develop a competitive transit solution. Once it has peering agreements with all Tier 1 operators, it can then become transit-free itself, and thus rise to the status of Tier 1 operator as well. This is the development trajectory of a network operator that some of the larger content and applications providers appear to be following, working to deploy their own infrastructure and move up the hierarchy.

3. State of interconnection in France

Transit and peering

ISPs in France use transit services to varying degrees, in large part depending on their size.

Incumbent carrier France Telecom supplies itself with transit services thanks to its AS 5511 (*Open Transit*). Depending on the source, it has thereby already become or will soon become transit-free.

The biggest alternative ISPs in the French market – i.e. SFR, Free, Bouygues Telecom and Numericable Completel – are all Tier 2 operators. Although they peer with one another, and with France Telecom, most of their international connectivity is obtained through transit services. This means they still need to buy transit services for more than half of their interconnections.

Meanwhile, the country's smallest ISPs, both local and specialized – such as Hub Telecom or Mediaserv – are Tier 3 operators, with transit being their sole source of interconnection.

Volume and financial stakes

At the end of 2011, the aggregate consumption of Internet users in France – of which there were over 22 million using a fixed line connection and close to 32 million using a mobile connection – was generating a demand for connectivity of around 3 Tbps. An ISP generally provisions around 100 kbps for a fixed Internet user, and ten to thirty times less for a mobile Internet user. This means that ISPs in France must deploy sufficient interconnection and routing capacity, either amongst themselves or with other French and foreign companies (CAP, hosting companies, transit operators, CDN) to handle total traffic of around 3 Tbps.

Taking as our working hypothesis that around two-thirds of interconnection is based on transit, and the average price of transit is roughly a few euros per Mbps per month, we can estimate the size of the market for inbound transit into France. This would translate into earnings for transit operators in the range of €20 to €50 million in 2011, including self-supply.

This is a small amount – around 0.5% – compared to the Internet access retail market which, fixed and mobile combined, generates some €10 billion in annual revenue. In other words, ISPs' connectivity costs have a 0.5-point impact on margins.

Appendix 7 Changing state of competition in IP interconnection

At the outset, the Internet had a pyramid structure. At the base of the pyramid, CAPs and Internet users purchased access from ISPs. These ISPs, most of which were local companies, relied on transit operators for all or a portion of their supply (traffic routing) to be able to provide their customers with worldwide connectivity. These transit operators, at the top of the pyramid, established usually settlement-free peering agreements with one another to exchange their respective customers' traffic.

In the years that followed, alternatives to transit emerged that – at least partially – called this pyramid structure into question. This section explains how these developments altered the balance of power between transit operators, CDNs, CAPs and ISPs.

1. Transit operators contending with heavy constraints in what appears to be a mature market

The transit operator business model

Transit is a highly competitive market, with prices that vary depending on the route, on the number of players competing for it and the amount of traffic being exchanged. As a result, transatlantic links, of which there are many and all highly trafficked, are among the cheapest in the world – contrary to links with Africa, for instance. According to market research firm, Telegeography[107], the average price of transit at the end of 2011, all routes combined, was around €5 per Mbps a month in Western Europe and in the United States, compared to around €30 per Mbps a month in São Paulo, Brazil and close to €150 in Nairobi, Kenya.

Transit prices are dropping sharply, by around 30% a year in Western Europe. This trend has been ongoing for at least 10 years now, and shows no signs of abating. It is the result of a stiff competition and a steady rate of technical progress. Also worth noting is that ISPs that use transit services usually negotiate rates below the advertised price.

It is worth remarking that the decease in the unit cost of transit is currently comparable to the rate of increase in Internet traffic. It cannot be said for certain that these two phenomena entirely offset one another – and are thus keeping the total cost of routing traffic through transit operators on an even keel – not least because the total amount of traffic handled by transit operators is in a state of flux. The information made available to ARCEP does nevertheless make it possible to estimate that ISPs pay transit operators around 10 eurocents a month, per subscriber, for worldwide connectivity, and that this amount has changed very little over the past several years.[108]

107 *The State of the Global Internet*, TeleGeography, October 2011

108 This figure was obtained based on global transit costs of around €20 to 50 million a year (cf. Appendix 6. A detailed look at interconnection) for around 50 million subscribers (2/5 wireline and 3/5 wireless). Imprecisions in the hypotheses mean the results are intended only to give a rough idea of costs, i.e. around 10 eurocents a month, per subscriber.

Game-changers in a highly competitive market

As mentioned earlier, the unit price of transit has been decreasing and continues to decrease sharply, particularly on the most competitive routes.

At the same time, we are seeing a growing number of alternatives to transit developing in various forms:

1. deployment of complete international networks that allow certain undertakings to develop their own long-haul transport infrastructure and to improve their connectivity, and particularly:
   - certain CAPs;
   - certain ISPs – in France, incumbent carrier France Telecom now has its own international network (Open Transit, corresponding to AS 5511[109]) which allows it to satisfy its own transit needs, while other operators such as Free are working to expand their international network, albeit to a smaller degree[110];
2. the development of secondary peering which does not involve those undertakings that have historically been at the top of the hierarchy, i.e. transit operators:
   - certain CAPs are severing ties with transit operators and instead interconnecting directly to ISPs. Exchange points have made it easier to develop this type of direct interconnection;
   - ISPs are interconnecting more and more with one another at the national or regional level, again in large part thanks to exchange points;
3. growth of the CDN (content delivery network) market which is replacing long-haul transport with nearby storage solutions for data, using cache servers.

Even if the total amount of traffic travelling over the networks continues to grow at a tremendous rate, so much so that the volume of traffic being handled by transit services is also rising steadily, the two previous trends – namely stiff competition and the emergence of alternatives to transit – would seem to indicate that the global transit market has reached maturity. And the players' revenue has more or less levelled off, as we can see in the financial figures released by Level 3[111].

As a result, transit operators are looking for new growth outlets, through two channels in particular.

First, we are seeing the onset of the transit market's consolidation, which has included Qwest's (Centurylink) takeover of Savvis in April 2011, followed by Level 3's acquisition of Global Crossing in October 2011. This consolidation will likely diminish the degree of competition in the transit market. This means that transit operators can hope to slow, and perhaps eventually stop, the decline in transit prices and so see their revenue start to climb, thanks to the ongoing increase in traffic, both overall and for transit services.

Second, transit operators are diversifying. This includes moving into the supply of broadband access, particularly with products aimed at specific needs – for instance, very low latency solutions for financial institutions, particularly for trading activities, or very high bandwidth (downstream and especially upstream) solutions for special events in locations such as stadiums, large concert halls, etc., and particularly for broadcasting. This diversification also involves the supply of CDN solutions, with recent operations in the sector that include Level 3's acquisition of Savvis' CDN business in January 2007, and Tata Communications' takeover of BitGravity in January 2011.

109 Cf. "IP network" tab on: http://www.francetelecom.com/wholesalesolutions/ournetwork/index.jsp

110 Cf. map provided by Free in its 2011 reference document: http://www.iliad.fr/amf/2012/documentdereference2011.pdf (page 39)

111 2010 annual report: the company's total revenue rose from $3.4 to $4.3 billion between 2006 and 2008, before dropping back to $3.7 billion in 2010.

2. CDN markets growing fast, even if competition is heating up on several fronts

The CDN business model

By default, a CDN does not have its own transmission infrastructure. A content delivery network is composed of a fleet of servers that are spread out more or less close to Internet users, and a software solution that optimises the distribution of the content by selecting the technically best and/or most cost-efficient route for it to travel, according to server availability, location and the status of the different interconnections to be used (load, financial terms, etc.)

A CDN uses other operators' systems to relay traffic (i) from their source (at a CAP) to its servers, then (ii) from its servers to the Internet user. For the first part of the journey, i.e. up to the CDN's servers, the content delivery network generally uses a transit service purchased from a third party. For the second part, i.e. transporting the data to end users, the CDN is interconnected either directly with an ISP (for free or a fee, depending on the agreed upon contractual terms) or again uses a transit service. In both instances, it is the ISP that ultimately transports the traffic over its access network up to the end user who requested the content.

A content delivery network earns its revenue from the contractual relationship with the content and application provider. Optimised routing is the basic solution on offer: it is billed either based on Internet users' usage (invoiced per Mb or Gb), or on the number of hits/page views. This basic service also allows the CAP to develop its connectivity, as in a transit relationship: by handing over its traffic to the CDN, it gains the ability to deliver its traffic to all of the ISPs that are interconnected with this CDN, and so to all of their client Internet users. A CDN will also generate (potentially substantial, i.e. up to 50% of its total income) additional revenue – generally billed as a flat monthly fee – through the sale of value-added services, such as data encryption, e.g. for the banking sector, transcoding, the supply of performance stats (reporting) or location-based services.

For a CAP, a content delivery network offers several types of added value, including:
- improving quality of service and the user experience;
- international connectivity, as with a transit operator;
- technical and commercial intermediation, as with a transit operator;
- serving as an alternative vendor to transit operators, helping bring down routing costs as a whole.

Transit operators' and ISP's vertical integration of content distribution (CDN)

Existing content delivery networks have two main competitive advantages over future new entrants: a large geographical footprint, backed by a good distribution of storage locations and interconnection relationships, a technological edge that allows them to provide client CAPs with superior quality of service and value-added services that are difficult to replicate.

Because of this, two new types of competitor are developing in today's marketplace which, unlike incumbent CDNs, have their own transmission network: namely transit operators' CDN and ISPs' or telcos' CDN[112]. Both of these types of content delivery network appear to enjoy one of the two above-mentioned advantages, at least in part.

Transit operators have a solid geographical footprint thanks to their original core business. Moreover, operating a CDN for them involves simply adding another technical layer as transit providers are already capable of transporting content up to the cache servers. Initially, however, the majority of transit operators do not have the same geographical presence as a pure CDN. It nevertheless seems probable that they will soon develop a centralised CDN model with several large datacentres in each region of the planet, rather than a distributed CDN system with servers located in a great many ISPs' networks, which would be a much more costly enterprise.

This vertical integration of the CDN business by transit operators does pose a threat to pure content delivery networks. The supply conditions for the latter could deteriorate as the number of pure transit operators willing to provide a high quality transit service at a competitive price decreases.

Meanwhile, ISPs have the option of installing cache servers in the network, including at the regional and possibly local level, and thereby optimising their routing performances – drawing on detailed knowledge of their network's load/capacity stress points. They can therefore hope to achieve optimal quality of service. However, the prospect of all CAPs having to negotiate interconnection, including via CDN, with every ISP in the world, naturally puts ISPs at a serious competitive disadvantage. The transaction costs of putting these agreements into place would be such that the need for intermediaries to establish the relationship between CAPs and ISPs (and their CDN) would seem to be unavoidable.

One final thing worth noting is that the biggest content and application providers (Netflix, Google, etc.) are also starting to roll out their own CDN, and so doing away with the need for outside transit providers.

Can we expect a restructuring of the CDN market?

The globe's largest CDN, Akamai, generated over a billon dollars in revenue in 2010[113], reporting a 13.8% annual rise in income since 2008.

The growth outlook is a healthy one given that most content is still not being transported via content delivery networks. We estimate that only close to 20% of global traffic today is being transmitted via CDN cache servers.

We are nonetheless seeing a strong increase in competition, coming from pure CDN (starting with Limelight), new entrant CDN (Cloudfront, Cloudfare, etc.) and network operators' (transit operators and ISPs) vertical integration. This, in turn, is driving a steady decrease in prices – at a rate comparable to the decrease in transit prices – and so in CDN operators' margins. The consolidation that is already underway in the transit market could therefore expand into the CDN market. Akamai's takeover of Cotendo took place in March 2012.

In addition, with the likely proliferation of local CDNs run by telcos (as described above) which are technically efficient but incapable of providing their client CAPS with a global solution – i.e. worldwide

112 SFR, for instance, in 2011 officially announced plans to start its own CDN business.
113 Cf. http://www.akamai.com/dl/investors/akamai_annual_report_10.pdf

presence and connectivity – various initiatives are underway to develop interconnection between CDNs. One possible outcome is the creation of a hierarchy of content delivery networks similar to that of network infrastructures. Pure CDNs and transit operators' CDNs could provide the first layer of global distribution – transporting traffic to a certain number of points of presence in each region, such as exchange points – and handing over to ISPs' CDN to achieve optimised distribution at the local level.

To prepare and plan for such a change in the market's structure, virtually all content delivery networks, including the biggest among them, are starting to develop a defensive (so still little advertised) white label service and technological support solution. These would be marketed to transit operators and ISPs that are in the process of building their own CDN solution.

3. Some CAPs are reaching the critical mass needed to enjoy real economies of scale and negotiating power

There are several possible business models for a CAP. Among the main potential sources of revenue are:
- the sale of ad space which can be billed by the number of impressions (number of times a banner is displayed) or by the number of clicks, which is the most widely used model;
- monetising subscribers' personal data for marketing purposes (e.g. Facebook, MySpace);
- paywall, i.e. charging users a subscription fee to access the CAP's content, services and applications (e.g.: Activision Blizzard, le Monde newspaper);
- direct product sales (e.g.: Adobe, Apple);
- commissions on merchandise sales transactions (e.g.: Amazon, eBay);
- sale of listing/referencing solutions, in particular for search engines (e.g.: Google, Yahoo).

Whatever the business model, content and application providers' revenue and margins do not generally correlate with the volume of traffic they transmit. In other words, a CAP may earn high margins on applications that generate little traffic, such as a search engine and, conversely, may earn smaller margins on applications that generate a great deal of traffic, such as a streaming platform.

An increasingly small number of CAPs is responsible for the majority of Internet traffic. This is due to the fact that the content, services or applications produced by these CAPs – which include the social networking site Facebook and the Google search engine – are particularly popular with Internet users. Some may even be qualified as indispensable as Internet users would have trouble accepting that they no longer have access to them.

Although users appear to tolerate slight and temporary degradations in the quality of these content, services or applications, it would be inconceivable for access to be completely cut off, without it having a serious impact the company's brand image and possibly losing it customers.

Moreover, network businesses, which naturally include telecommunications, are based on business models with high fixed costs. As a result, economies of scope and scale can be considerable. This means that, once it has reached a critical mass, a CAP can deploy and operate its own network – by gradually integrating all or a portion of the following functions: network access, hosting, long-haul transport, CDN – and negotiate its own interconnections. The expenditures needed to deploy and run one's own network result in annuities

that are smaller, over the long term, than the cost of renting capacity and transit from third parties (once a certain volume of traffic is reached). In addition, a CAP with a vast enough network will be able to interconnect directly with ISPs, with the added bonus of improved quality of service as the traffic does not need to go through an intermediary.

The biggest content and application providers are therefore gaining a significant position in the marketplace and real negotiating power.

On the other hand, it is likely that most of the smaller CAP will never become big enough to deploy their own infrastructure or for Internet users to view their services, content or applications as essential. So these content and application providers will continue to rely on transit operators or CDN to transport their traffic to Internet users.

CAPs like Pages Jaunes (French Yellow Pages) or M6Web (French TV channel), whose geographical target is relatively small – i.e. national or slightly beyond – may constitute notable exceptions to the rule. Most will be able to interconnect directly with the ISPs serving their target market, first because their physical production location is relatively close to the interconnection points and, second, because they only need to interconnect directly with a small number of ISPs (or require only small volumes of interconnection traffic) to reach their target users.

Lastly, Internet hosting companies will continue to be important partners for those CAPs that do not want to worry about the technical side of managing their production – preferring turnkey hosting and security solutions – or are too small to negotiate advantageous terms of transit on their own. A hosting company has greater negotiating clout as it pools the traffic being generated by a number of CAPs.

Here again, when transporting content with a geographically narrow target audience, Internet hosting companies will be able to interconnect directly with the few ISPs that enable them to cover their target service area, without having to deploy a vast network infrastructure (e.g. at a single peering point).

4. ISPs looking for growth outlets in the wholesale market

ISPs in search of growth outlets are exploring several strategies, and many are focusing on two options in particular the wholesale market.

Increasing CAPs' contribution to costs

Some ISPs, notably in France, envisage to have CAPs contribute more to financing the networks, either directly or indirectly through technical intermediaries – especially transit operators and CDN. There appear to be two main schemes being examined here: first, monetising interconnection directly – which would involve introducing a solution that is often referred to as IP termination[114], whereby the ISP charges interconnected players to convey their traffic over the network to end users – and, second, developing paid, tiered interconnection solutions, alongside standard interconnection offers.

114 As an analogy with the billing model of call termination for voice communications.

Monetising interconnection directly

Some ISPs are trying to introduce a paid component into their peering relationships with content and application providers – and possibly transit operators whose clientele is made up chiefly of CAPs. This component would apply only to the traffic that exceeds the maximum ratio defined in the ISP's peering agreement – e.g. 2:1 or 2.5:1. The fact of exceeding a maximum asymmetry allowance would indeed provide proof of the different nature of the peers or, more specifically, reveal the type of clients that each peer has – in other words mainly CAPs or mainly end users. This asymmetry would justify demanding financial compensation, particularly since the increase in traffic towards end users would be more beneficial to CAPs' business model than ISPs' (whose revenue is affected very little by the increase in traffic under today's most widely used retail pricing schemes).

Paid peering models like this have existed for a long time between stakeholders on transit market and were recently extended to some ISPs. For instance, according to several public sources[115], the peering agreement between transit operators Level 3 and Cogent has included a clause stipulating the financial compensation to be paid beyond a set ratio since 2005. Another example comes from American cable company and ISP Comcast which is known to have been charging its technical partners for peering for several years..

The swift development of paid peering beyond the current level seems difficult to achieve. If ISPs are by nature the only players in a position to relay data to their subscribers over their own access network, the countervailing power of their direct commercial partners – i.e. directly interconnected CAPs, transit operators, CDN and other ISPs – remains significant. Because of their size and the control they may have over access to certain content and applications, some of these commercial partners may enjoy a countervailing power as ISP's customers give great importance to the conditions under which they access the content and applications supplied by its partners, and these conditions depend on interconnection with the ISP. As a result, aside from cases where the interconnected partner finds particular value-added – notably in terms of quality of service[116] – in peering, IP transit is likely to constitute a substitute product and its price, which has dropped sharply over the past several years, may be point of comparison which could reduce the risks of excessive pricing..

Switching from a free to a paid model can lead to difficult negotiations between the parties. It can also have real repercussions on interconnection: namely decreasing or capping capacity (e.g. between Free and Google[117] or the case of Cogent vs. France Telecom mentioned earlier) and even having peer connection completely cut off in extreme circumstances – luckily only briefly given what is at stake, as happened when paid peering between Level 3 and Cogent began in 2005.

From an economic perspective, the development of this type of system would likely have consequences that would need to be examined closely.

115 See, for instance, http://www.crn.com/news/networking/172901642/cogent-level-3-makeamends.htm

116 The quality of the peering (direct interconnection) service, as opposed to the quality of the transit service. An ISP's ability to offer interconnection with different QoS levels (SLAs) is addressed in the next section.

117 See, for instance (in French): http://www.numerama.com/magazine/20728-suspecte-de-brider-youtube-free-veut-que-google-investisse-davantage.html

ISPs' monetisation of their interconnection would result, first, in a clear definition of the price of the service rendered – namely relaying data on the ISP's access and backhaul network. It could serve to inform customers of the value and, indirectly, the cost of the thing being exchanged, and so introduce an economic measure of efficiency. Even though it may be slight, this economic measure could help create an incentive to optimise the traffic being sent (type of encoding, terms and conditions of use for the services, etc.).

This monetisation would also naturally result in an additional charge for CAPs, and so an increase in their internet connectivity supply costs whose impact, particularly in terms of their ability to innovate with content, services and applications, would heavily depend on the prices applied and the type of services involved. Revenue and traffic volume are by no means proportionate for CAPs, so much so that some potentially innovative activities which generate a great deal of traffic and may need to alter their business model. So distributing TV/video content, and particularly in high definition, could be affected by the introduction of a system for charging for direct interconnection, whereas other services that consume less bandwidth, such as online shops and social networking sites (aside from photo and video-centric ones), run little risk of any upset. The potential impact would depend directly on the amount that ISPs charge. It could thus be quite small if paid peering charges remained below current transit prices, for instance. Indeed, up until now the transit charges that ISPs and CAPs alike have had to pay have not hindered innovation or the proliferation of content, services and applications – quite the contrary.

What also needs to be measured is the risk of ubiquitous paid peering causing discrimination between CAPs particularly if, by leveraging their market power, the larger content and application providers managed to avoid the charges imposed on smaller CAPs who are unable to negotiate.

In its proposals in 2010, ARCEP reiterated that interconnection is vital to ensuring a "seamless" Internet, and that it needs to be established in an objective and non-discriminatory fashion. Should ISPs develop paid peering offers, they would need to sell them in a transparent and non-discriminatory manner to all other undertakings, whether CAPs, CDNs or transit operators. ARCEP will be careful to ensure that ISPs and CAPs continue to obey this rule. The aim of the work that is currently underway is to enable ARCEP to closely monitor developments in this arena, and to take action if necessary down the road. The information gathering campaigns introduced by the Decision of 29 March 2012 will play an important part in this process.

Development of differentiated interconnection tariffs

Meanwhile, some ISPs want to offer special terms of interconnection, in exchange for payment and governed by bilateral agreements. The special terms may include:

- delivery to a local/regional peering point[118];
- hosting local/regional cache servers;
- ISP itself caching traffic at a local/regional point;
- offering SLAs on different classes of services, with prioritisation.

118 Up until now, interconnection between networks has generally occurred at a small number of PoPs at the national level, located relatively far from end users. Some players are planning on interconnecting at points lower down the network that are closer to end users, i.e. regional or local peering points. When interconnecting closer to end-users, a CAP improves the routing performances of its content and application, but also reduces the costs of the partner ISP, therefore the CAP may benefit from better financial terms.

The purpose of these new wholesale interconnection solutions is to better segment the CAP clientele, and provide interconnection services of varying levels of quality. Although operators are largely free to negotiate the technical and commercial terms governing the supply of IP interconnection solutions, they are obliged to grant interconnection requests from other undertakings that operate networks open to the public within the framework provided for by Law.

As stated in the 2010 proposals, interconnection offers must be transparent and non-discriminatory. ARCEP will be particularly careful to these points through its information gathering campaigns.

Moreover, should an ISP employ traffic management techniques downstream from interconnection – such as traffic prioritisation through the creation of a specialised service carrying SLAs, for instance – they need to comply with the framework which is described in section 2.3 and detailed in Appendix 8.

Diversification

A great many ISPs are planning on diversifying their business, and particularly on moving into transit, CDN and the production of content, services and applications.

When diversifying into transit, ISPs begin by deploying their own international network to lessen their dependence on third-party transit services. Several such initiatives are mentioned above. Next, an ISP whose international network and peering agreements have been sufficiently developed will be able to start selling transit services itself: such is the case with France Telecom which sells transit to a number of CAPs operating in France.

When diversifying into the content delivery network business, the concept of telco CDN – in other words an ISP that deploys cache servers and a CDN solution on its own network – is described above. Although a number of ISPs – e.g. SFR, British Telecom, TeliaSonera, etc. – have announced this type of initiative in the media, there are as yet very few large-scale telco CDNs in the world today.

Indeed, despite the very positive outlook for optimising network performances, reducing costs and delaying the investments needed to increase network capacity, it seems very unlikely that most third-party CAPs could be persuaded to negotiate their interconnection with each telco CDN individually, in other words with each ISP in each target market. Large-scale rollouts will therefore require that credible intermediaries – from among existing major transit operators and CDNs – be able to supply a single interconnection interface, i.e. a sort of CDN transit solution, with a large number of telco content delivery networks.

Appendix 8 In-depth analysis of traffic management practices

Below, ARCEP describes the traffic management practices that are either being employed today on French ISPs' fixed and mobile networks, or likely to be as they have been observed in other European countries. We will also look in particular at how compatible these practices are with proposals Nos. 2, 3 and 4, as formulated by ARCEP in September 2010.

The purpose here is not to bring judgement on these practices, but rather to shed light on the debate and provide a more detailed examination of the terms of analysis that the Authority plans to apply. The ultimate aim is to provide all stakeholders with as clear a picture as possible, starting with an analysis of existing practices in the marketplace.

1. Data caps regardless of application type

Data caps on wireline networks

The most commonly applied condition of fixed Internet access products in France is unlimited consumption. There are exceptions to this, particularly in overseas markets where the higher cost of connecting to other global networks is reflected in the terms of the offers: consumers are charged for their traffic beyond a certain allowance, and for certain technologies whose traffic-related costs are higher than on traditional wireline systems (i.e. ADSL, cable, optical fibre).

Operators regularly point to the disparities in users' traffic, and to the fact that a very tiny percentage of their customers have extremely high consumption levels. The ability to segment their clientele according to usage and introduce capped offers (i.e. with a set traffic allowance) has been mentioned – and triggered highly contentious discussions – but has not yet been implemented to any significant extent. A distinction also needs to be made between the two approaches being explored:

- segmenting Internet access products by applying tiered pricing based on usage;
- continuing to market a single plan but carrying a fair use clause, with users' traffic throttled or cut off once their allowance has been reached.

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The first thing that needs to be said is that these practices do not, as such, fall under the heading of net neutrality in the strictest sense of the term. They do not involve discrimination based on the content or service – and thus comply with proposal No. 2 – but relate simply to the quantitative aspect of the supplied connection. This is essentially an economic question, concerning the link between the price and performance or quality of its access products that an ISP might seek to reinforce. Therefore, there is no reason to analyse this practice in the light of the five criteria for differentiated treatment of traffic (proposal No. 3).

119 See Appendix 1: ARCEP's ten proposals.

The following aspects, regarding network economics and competition in the broadband market, can nevertheless be noticed.

In a competitive retail market where unlimited access for a flat price is now the de facto standard, the first approach appears unlikely to be introduced in the short term. If an ISP begins segmenting its products without it being justified by the costs being shouldered by all ISPs, it will probably feel pressure from the unlimited access offers being marketed by its competitors that continue to be economically viable, which will adversely affect its customer base. This competitive pressure will be fully felt as it concerns a core feature of the access service. Indeed, fluctuations in traffic currently result in only slight cost variations: the fact that a user generates a great deal of traffic induces very little additional cost, in the short term, for their ISP. It can therefore be estimated that when a fixed user's consumption is three times the average, their ISP allocates a corresponding monthly cost which is approximately €1 to €1.5 higher than average consumptions[120].

In such a context, Internet service providers may nonetheless have a desire to control the steady increase in consumption over the long term, by sending out certain economic messages. The second approach would probably materialise before the first, and warrants several remarks.

Such a measure does constitute a core feature of the access product. It needs to be carried out in a very transparent fashion, in other words the terms of application need to be clear and users need to have easy access to information on how much traffic they have consumed. Under such conditions, it is probable that competitive pressure will have a very significant effect on this type of measure and will act as a regulating force.

As a conclusion, ARCEP considers this issue to be distinct from the issue of net neutrality. Given the competitive situation on the fixed broadband retail market, data capping tools are not expected to develop for the time being. However, operators have to adjust their offer to the technical and economic production conditions on their networks. In this respect, should such data capping tools develop, they would be carefully assessed in view of general obligations to fairly inform consumers on the characteristics of commercialized offers; nevertheless competition should remain the main regulating tool, and it seems well-positioned to do so on this issue.

Data caps on mobile networks

Data caps are ubiquitous in mobile access offers. They take the form of a set allowance, expressed in Mb or Gb of traffic a month, to which at least one of the following measures is applied once that allowance has been reached:

a. the connection is blocked until the next billing period, sometimes with an option allowing to buy more credit;
b. the connection remains active, but the user will be charged for their overage until the next billing period (this practice is little used);
c. the connection is maintained and the user is not charged extra, but their connection speed is throttled (this is the most widely used practice).

120 See Appendix 5 on costs for the different calculation scenarios.

There are two goals behind this practice: avoiding overloading mobile networks by controlling users' consumption levels, and segmenting the service so that customer billing is commensurate with their consumption and/or willingness to pay extra. Because mobile networks do indeed have a limited capacity, which is shared between users very low down in the network, and the costs induced by mobile data traffic are still very high[121] these goals are legitimate. Besides, the fact that caps on traffic volume appear to apply to all data, regardless of the service being used by the Internet connection, means there is no discrimination against specific traffic streams. These caps fully comply with proposal No. 2.

ARCEP does not consider these practices warrant any special remark as regards net neutrality.

On the other hand, these practices often fall short when it comes to transparency, even if some progress was recently made. Such a measure does constitute a core feature of the access product. It needs to be carried out in a very transparent fashion, in other words the terms of application need to be clear and users need to have easy access to information on how much traffic they have consumed. Under such conditions, it is probable that competitive pressure will have a very significant effect on this type of measure.

Transparency must be effective at two levels: first, the limitation rule must be clear and the way traffic is handled once the threshold has been met must be explicated (if traffic is throttled, this must be quantified); second, users must be able to monitor their consumption and adjust it before they reach the threshold, by easily accessing to a data meter. Works being carried out on transparency should result in progress on this matter.

There are also mobile offers whose data plans have traffic caps that are differentiated by the type of service or application used by the Internet connection. These are analysed below.

2. Differentiation by type of application or service

Prioritising specialised services

Internet service providers that also sell specialised services to their users – such as voice over broadband or IPTV as part of their bundled offers – prioritise the content supplied by these specialised services. Their goal is to ensure maximum availability for their telephone services as well as a sufficiently high quality connection for TV programming. This is achieved by allocating reserved capacity on the "last mile" of the network, which may reduce the maximum bandwidth that remains available for Internet access. The decrease in speed on an ADSL connection when the television service is being used is typically at least 2 Mbps, which will be felt by the customer and could slow some of their web browsing. ISPs will usually check that the customer's line has enough bandwidth to support this combination of services. Upstream from the last mile, the TV service's delivery in most cases relies on a dedicated channel on the network, which does not affect the quality of the Internet connection.

121 The Authority considers the cost of transporting traffic on mobile networks significantly exceeds the cost of transporting traffic on fixed networks. This difference justifies mobile operators' use of specific measures to control traffic growth.

This practice of prioritising certain services on access networks is commonplace amongst ADSL operators. However, on networks that use coaxial cable in the last mile, the television stream is delivered up to end users over an independent channel and so does not affect the bandwidth allocated to Internet access. The issue is also a minor one for fibre-to-the-home (FTTH) systems whose bandwidth enables the supply of very high definition TV streams without noticeably affecting the comfortable use of the Internet connection.

Specialised services which prioritize certain streams within traffic are much more common on wireline networks than on wireless ones. Video services are far more rare on mobile systems because of the scarcity of capacity, and because these systems already use a dedicated channel to transport voice (both on 2G and 3G systems). Future 4G networks will provide with higher capacities and alleviate these restrictions to a large extent.

Because of these respective properties, the first thing to note is that specialised services are distinct from Internet access, even if they are usually supplied alongside it, using the same broadband connection. As a result, they are covered primarily by proposal No. 4 and recognising the legitimacy of specialised services. It can nevertheless be assessed with respect to the criteria listed in proposal No. 3, particularly as certain forms of content prioritisation could in future be implemented in a way that is less clearly distinct from Internet access. The Authority therefore underscores, more strongly than in 2010, the fact that, in this regard, there is a continuity between these two proposals.

Prioritisation guarantees a degree of quality that is vital to ensuring certain specialised services run smoothly. It can be considered relevant as it makes it physically possible to achieve this objective, and because this appears to be a legitimate objective. In its fourth proposal, ARCEP also underlined that specialised services could be beneficial to all the stakeholders, provided the quality of the Internet access service is not degraded beyond a certain acceptable level.

The proportionate nature of prioritisation lies in the fact that it has a low overall impact: use of the dedicated channel on the networks affects all customers' Internet connection, but very slightly. On the other hand, a customer's use of the specialised service may have a considerable impact on the last mile of their own connection, and so on the quality of their Internet access. But the customer still has control over the service, i.e. he or she can turn it on or off, and their use of it does not affect other customers.

All of the services and content being relayed by the Internet connection will experience the same degradation in quality when a specialised service is activated, which guarantees non-discrimination. It does not, however, seem advisable to make a set list of existing or potential specialised services, as new specialised services need to be able to develop easily – in accordance with the principles set in out proposal No. 4.

To this end, and as ARCEP already expressed in September 2010, it would be worthwhile for CAPs to have access to an open and non-discriminatory solution for distributing their services, with a controlled level of quality, supplied parallel to Internet access, and provided the latter continues to be of sufficiently high quality. This could help stimulate innovation in services for which certain features need to be controlled – such as B2B and possibly B2C applications in the areas of manufacturing, healthcare, etc. – while developing new revenue and growth opportunities for operators. Many such services today are being marketed by only a single operator, which reduces users' choice to a single enterprise or demands coordination between users on the choice of electronic communications provider, which naturally constitutes a sizeable barrier to the development of such services.

This management of priorities needs to be transparent to the user, in other words every user needs to be able to know how a given specialised service will affect their Internet connection, before they subscribe to an access product. ARCEP notes that this information is rarely made available to ISPs' existing and potential customers.

Targeted throttling of certain applications on wireline connections

Some operators distinguish between several types of traffic on a fixed Internet connection, and assign them different levels of priority. To the Authority's knowledge, this is not a widespread practice, and is confined to a small number of operators and only a fraction of their customers.

The type of traffic that is given the lowest priority corresponds to file sharing/transfer applications (P2P, possibly FTP) which, according to these operators, quickly eat up a great deal of network capacity and, if not handled in a particular way, will significantly degrade the bandwidth available to other users. Operators' approach, then, is to ensure that interactive services remain usable under good conditions, which is achieved by throttling asynchronous services for which a decrease in network quality is less problematic. In other words, these latter services can still be used, but performance will be diminished.

When it does occur, this practice appears to be, above all, the result of a choice between cost and quality of service, with two complementary goals in mind: managing congestion when routing or bandwidth capacity is solicited for file sharing, to the point that it degrades the quality of service for other users, and controlling traffic costs when the ISP relies on another operator's wholesale solution to serve its customers – in which case traffic generates variable costs, rather than being a set investment cost.

By and large, the Authority considers that, because it is a viable and lasting solution, investing in the networks must be the chief response to traffic congestion problems. If remedies such as traffic management must be considered, their goal must be to share network capacity between end users under the fairest and most efficient terms possible.

ARCEP underscores the fact that targeted throttling can have sizeable consequences: it threatens the Internet access product's equal treatment of services, causes prejudice to the use of certain services or protocols, and may constitute anti-trust behaviour. As a general rule, then, it is unadvisable.

Treating a certain category of traffic in a specific way may be relevant if it has objectively measurable technical characteristics that are particularly apt to cause congestion – notably if these "greedy" applications tend to pre-empt network capacities at the expense of other applications. Any response to this problem must be proportionate, to achieve as measured an effect as possible: blocking would seem, in theory, to be an excessive measure if throttling will suffice. By the same token, it may be unnecessary to use such a measure at all, including during off-peak hours. Any measure must be efficient, allowing an operator to truly ensure a sufficient and fair quality of service, and not make certain uses of the network impossible. In essence, then, a service-agnostic approach would appear preferable in all instances, as it will be less harmful and is often possible.

If there are no solid economic arguments for targeted throttling, market competition should help make these practices a rare occurrence, as is already the case. Transparency plays an important role here: operators must inform their customers of any such practices – which is often not the case today.

An economic argument may nonetheless be found in the variable costs of traffic that operators need to assume. In non-unbundled areas, throttling may indeed seek to limit the amount an alternative operator needs to pay the incumbent for bitstream solutions (which consist of renting bandwidth at a price that varies according to traffic). Here, it is worth mentioning that ARCEP recently altered the structure of these rate schedules to lessen the variable portion, which in turn lessens the incentive to engage in throttling. In any event, transparency over such practices remains imperative.

In addition to transparency, which is an obligation being imposed on all ISPs as of today, ARCEP offers a reminder that a CAP which considers itself the victim of a harmful prioritisation practice will likely appeal to the Authority to settle its dispute with the ISP in question. ARCEP could therefore use the five criteria to analyse whether the practice qualifies as traffic management. The Authority would pay particularly attention to the issue of non-discrimination of players: any prioritisation of traffic on an Internet connection must be supported by technical and objective criteria, and not be aimed at favouring certain service, content or application providers over others.

Targeted blocking of certain applications on mobile networks

Some mobile calling offers that are bundled with a data plan block certain applications – the most common ones being peer-to-peer file sharing, Voice over IP (VoIP), newsgroups and using the handset as a modem for sharing its Internet connection (tethering). In some cases, users can access these blocked applications by subscribing to a special option and paying an additional fee.

These restrictions are usually indicated in the sale's contract's terms and conditions, and have relatively little impact on most users. They nevertheless have the power to stifle the development of future innovative services or restrain the handset's functions. Operators are applying several types of blocking, which are discussed below.

First, the aim of blocking Voice over IP (VoIP) services is to prevent customers from using an application that competes directly with the operator's own calling service. This still widely employed practice harkens back to mobile operators' business model, as some telcos still earn the bulk of their revenue from calling services and want to control the use of data services, which do not necessarily generate a great deal of income for them. The argument of trying to avoid congestion is not a convincing one as transporting voice does not consume any more network resources than other types of authorised traffic. The criteria of relevance, as defined in proposal No. 3, is therefore clearly not being met.

Second, operators justify their blocking of P2P file sharing and access to newsgroups primarily with the argument of wanting to control the volume of traffic generated by users. While it is true that these applications do increase the load on the network, it seems a disproportionate response to block them entirely when less brutal measures would suffice to manage the flow of traffic.

It is hoped that these forms of blocking, which fall outside the scope of what the Authority defines as admissible practices in its proposals, will disappear. The market is starting to offer alternatives: the arrival of a fourth mobile network operator has served to amplify nascent trends, with several operators now marketing offers that do not block specific applications, and are apparently no more expensive than those that do. As a result, end users are gaining access to an increasingly wide choice of products, which marks a positive step forward in operators' practices. The Authority will continue to be mindful of the promulgation of this shift in the marketplace towards fully open services.

Blocking the use of a handset's tethering function – which allows users to connect several devices to the Internet using a single mobile handset – needs to be distinguished from the previous two forms of blocking. It does not block users' ability to send and receive any type of stream, and as such constitutes less of a threat of discriminating against other players, and is less likely to stifle innovation. It nevertheless violates the ability to connect any hardware to the network (proposal No 1) and it is hoped that it will disappear.

It is understandable that blocking will cease and access products will open up only gradually, particularly when it entails making changes to existing business models. More specifically, on the matter of VoIP, there is an overriding trend of increasing mobile data traffic that makes the advent of mobile VoIP more or less inevitable. This means that, as with the developments that have occurred over the past several years on wireline networks, mobile operators will need to alter their business models to adapt their revenue streams – which are still largely built around calling services – to the fact that data services account for an increasingly large share of mobile traffic.

If blocking continues to be a common practice, the Authority could adopt a more prescriptive approach, particularly on the basis of CPCE Article L.36-6 which stipulates that, "*the Electronic communications and postal regulatory authority can set minimum quality of service requirements to prevent a degradation of service and the obstruction or slowing of traffic on the network*". For now, ARCEP has the power to settle disputes between operators and CAPs concerning the reciprocal technical and pricing terms governing traffic routing. Should such a dispute arise, ARCEP may be required to investigate an operator's blocking practices and any discriminatory effects it might have on the CAP.

It should also be remembered that all operators currently engaged in blocking applications have an obligation of transparency. Moreover, as stated in proposal No. 5, it would seem inaccurate to employ the word "Internet" to describe access products which come with some level of blocking. Should the word "Internet" be used, the operator would be required to specify that restrictions apply to its offer with, at the very least, a mandatory and very clear indication in equally large type of what those restrictions are, i.e. which applications are blocked.

122 According to the allocation carried out by operators in the information sent to ARCEP for the observatory of electronic communication services, in Q1 2012, 70% of their retail revenue on mobile market came from voice, 15% from messaging (SMS, MMS) and 15% from data. It should however be noted that this breakdown derives from rules which determine how to allocate revenue from retail offers which often come as flat-rate, bundled, multi-services offers; its meaning should therefore be taken with caution.

Application-specific data caps on mobile networks

There are mobile offers whose data caps vary depending on the type of service being used by the Internet connection. These offers can be broken down into two categories whereby, for the sake of convenience, X refers to the Internet service or services that enjoy special treatment (typically a popular website).

- "Nothing + X": the operator does not offer access to the Internet, but only to service X which can be accessed up to a certain traffic allowance;
- "Internet + X": the operator does offer Internet access with a data cap, but offers better conditions for accessing service X – e.g. with a separate and higher traffic allowance than for the rest of the Internet.

The example of "Nothing + X" cannot be qualified as an Internet access offer, but only as access to a very small portion of the Internet. There are widely varying examples of this, and it may even be said that connected devices – such as eBook readers, certain GPS devices, etc. – are "Nothing + X" offers since they use an Internet connection to deliver a narrow data exchange service. This category also includes specialised services as described above. It should nevertheless be said that it is typically the connected device that is marketed to users, rather than the service in itself.

For the purposes of this document, our analysis will focus on ISP products that offer limited access to a few popular websites or applications, in many instances alongside open access offers. ISPs' main motive here appears to reside in the appeal that service X holds for its target clientele, and the fact that average consumption on such a limited connection will also be low, which allows the operator to control its costs. This type of offer is likely to appeal to a small segment of end users who will find in it an economical way to access a given service. ISPs will seek to target an especially small section of users as its goal is to avoid having its general access customers move en masse over to its narrower access products.

The "Internet + X" offer has the same underlying logic. The fact of identifying a particular service and assigning it a higher (or possibly unlimited) traffic allowance than the rest of the Internet is likely to attract users who are heavy users of that service. The ISP calculates that it will probably be able to control the average data traffic generated by use of this specific service, and may even offer the service at a lower price than access to the entire Internet (with the same data cap). The economic argument is similar to the one underlying offers of "two hours a month of calling plus unlimited calls to three numbers": the fact of favouring a very small number of services (here, three numbers) allows the operator to ensure that, on average, customers will not make excessive use of the unlimited service.

If they can guarantee a certain economic efficiency, this type of service nevertheless requires certain provisos and serious oversight.

A "Nothing + X" offer cannot be called an Internet access product if it does not allow users to access services other than those that are initially listed. If the offer does give users the option of accessing the entire Internet in exchange for an additional fee (e.g. via top-ups), then it would be more akin to the "Internet + X" model.

It should be therefore strictly forbidden to use the word "Internet" to describe "Nothing +X" offers. Although such offers are not prohibited, the Authority considers it regrettable to segment Internet access and not allow users to employ services other than the ones initially included in the offer. The ability to "discover" new services and develop browsing habits that are different from the ones initially planned when signing up for the service is an important feature of Internet access.

While it is recognised that applying certain restrictions allows ISPs to charge an especially low price, tailored to certain consumers, it is nevertheless important for a service that provides access to the entire Internet to also be available so that users can, under reasonable conditions, explore the whole of the Internet once access to the initial narrow selection of sites/applications no longer suffices.

An analogy can be made with a telephone service whose appeal lies largely in the fact that any subscriber can call any other subscriber, which ensures ubiquitous "connectivity". The law forbids the sale of products that do not allow users to reach every number.[123] Moreover, in July 2010, the Authority issued an opinion on high-volume offers that excluded certain fixed numbers, stressing that these practices were, "*disproportionate, arbitrary and discriminatory. Such practices are unacceptable as they are detrimental to both callers and call recipients, and particularly businesses. They must therefore disappear rapidly*"[123].

An "Internet + X" offer has the advantage of allowing users to discover other services. The differentiated data caps do nonetheless translate a practice that consists of treating data streams differently, depending on whether they correspond to Internet access in general or to service X in particular. This practice is likely to induce discrimination between players. The specific qualification of the practice depends on the way service X is defined (whether it applies to a type of traffic in general or to a particular service provider), and how open the ISP's practice is to service providers. In any event, if an ISP favours one CAP over its competitors – e.g. one social network but not others, a specific mail/messaging service, a specific streaming service, etc. – and does not grant reasonable requests from other CAPs for equivalent terms for relaying their traffic to end users, it may constitute a discriminatory practice. This would be particularly true if there is a differentiation in the terms governing users' access to service(s) X and to the rest of the Internet.

It should be remembered that the Authority has the responsibility of ensuring "*that no discrimination exists, under analogous circumstances, in the relationship between the operators and providers of publicly available online electronic communication services in traffic routing and access to these service*"[125] and that it may be called on to settle a dispute over the "*reciprocal technical and pricing terms and conditions governing traffic routing between an operator and an undertaking providing online communication services to the public*," [126] which would result in a detailed analysis of the case at issue.

123 CPCE Article L. 44-2: "Under the condition that it is technically and economically feasible, operators will ensure that end users have access to all numbers assigned in the European Union, including those in the European Telephony Numbering Space and Universal International Freephone Numbers."

124 ARCEP Press Release of 26 July 2010.

125 CPCE Article L. 32-1, II.-4°bis.

126 CPCE Article L. 36-8, II.-5°.

3. Differentiation by user

Users today do not enjoy absolute equality in their Internet access conditions, whether in terms of the price they pay or performance. This disparity is due primarily to three phenomena:

- the available access network's theoretical performance. Fixed line networks – e.g. xDSL, fibre-to-the-home or FTTLA (fibre with coaxial termination) – can have widely varying headline speeds, ranging from 512 kbps for the slowest ADSL up to several dozen Mbps for an FTTH or FTTLA line;
- the features of the access service which may throttle the connection (this applies to both fixed and mobile networks) or, on the contrary, provide a guaranteed minimum level of performance or bandwidth availability, as is the case with access products for businesses;
- and, finally, the equally essential parameter of how well the operator's network performs: network equipment's performance, provisioning, load balancing, etc.

These phenomena do not contravene the guiding principles of freedom and quality of Internet access (proposal No. 1) or non-discrimination between Internet access streams (proposal No. 2): the data sent and received by users are transported over ISPs' core networks under comparable conditions, using best effort delivery, and the traffic of a "higher performance" user does not enjoy special treatment that degrades other users' traffic. It is especially important that users be able to upgrade their performance level, and that this superior level will not affect the quality of other users' connection. Once this is the case, the question of varying performance levels would not, generally speaking, fall within the scope of the Internet and network neutrality debate.

The Authority remarks that offers guaranteeing a minimum connection speed generally rely on greater provisioning of the networks, with customers (usually enterprises) being billed in kind. These offers are likely to have a positive effect on operators' spending on infrastructure, and so be beneficial to all users.

We may nevertheless see the development of offers that assign varying degrees of priority to customers' traffic, and which are based on altering traffic routing priorities rather than provisioning tailored to capacity – in which case a high-priority user's traffic would adversely affect the quality of service experienced by a low-priority user. The rules governing this prioritisation are variable. In the most extreme (fictional) case, we can imagine that low-priority users' traffic will be completely blocked when the network is congested.

The Authority is not aware of such practices being employed in the French residential market today. They are nevertheless employed in certain foreign markets and being examined, at least on a trial basis, in France's enterprise market. Their widespread use would raise serious questions and would require a certain level of vigilance.

This type of traffic prioritisation needs to be analysed, first, in terms of proportionality, as the goal of effectively working to prevent congestion must not cause a disproportionate degradation in the quality of certain users' connection. The prior information given to customers, and their ability to switch access products to enjoy a better service, also need to be examined.

In a market as competitive as the French market can be, it seems unlikely that an ISP would engage in such a practice if it does significantly degrade the quality of service experienced by a substantial number of other subscribers. It would have trouble recruiting new customers, and could see its existing customers switch to the competition. Therefore the real issues appear to be assessing the quality of service actually supplied on different offers, the fact of allowing customers to make an informed choice on the matter, and ensuring that basic Internet access service continues to be of sufficiently high quality.

So the possibility of tiered prioritisation offers being introduced into the marketplace only emphasises the need to monitor quality of service. QoS must be measured and the general findings for each ISP made public, along with individualised information for each user, before and after they subscribe to a service. Having already stressed that Internet access services must maintain a sufficiently high quality, ARCEP will be particularly attentive to this question and will engage in targeted actions to this end.

Also worth reiterating is that operators are subject to transparency obligations which will apply should they introduce traffic management measures that distinguish several user profiles, with each one being assigned a distinct priority.

4. Security measures and legal injunctions

Security measures

For the sake of security, most operators employ blocking techniques that restrict certain uses of the network. On fixed networks, it is therefore not uncommon to see port 25 blocked to prevent massive spam attacks by computers that have been hacked. ISPs may also apply data caps to customers' mail accounts.

From a more general perspective, operators can take a variety of either timely or permanent measures to guarantee the security and integrity of their networks. These can occasionally have a sizeable impact on users, right up to making certain content, services or applications temporarily unavailable.

Network management is operators' very business, and it necessarily involves a number of initiatives whose purpose is to ensure their network runs smoothly, and protect its security and integrity. In particular, operators must comply with certain legal obligations. CPCE Article L. 33-1 stipulates that: *"the establishment and operation of networks that are open to the public and the supply of electronic communication services to the public must comply with rules on: a) the conditions of permanence, quality and availability of the network and the service, which include obligations to notify the competent authority of any security breaches or breaches of the network or the service's integrity. [...]"*

ARCEP recognises the importance of this issue, and considers that because it is such a complex and sensitive one, it is especially difficult to establish a precise framework for what are considered acceptable practices.

The principles that govern traffic management nevertheless apply to all of these practices, regardless of their ultimate objective. Relevance, efficiency and proportionality, as well as non-discrimination against other players – unless they are harming the network – remain rules to which security does not constitute an exception.

ARCEP is nevertheless aware that in certain cases, and particularly situations of substantial and imminent threat to the network, strong measures may be taken temporarily. Any undertaking implementing such practices is called upon to use the utmost discernment, and must make every effort to limit the consequences of such measures.

Lastly, on the matter of transparency, the Authority invites ISPs to describe the limitations they impose, in theory, on users – as required by Law. If publishing some of these measures would render them ineffectual, the Authority could tolerate employing broader terms to satisfy the imperative of transparency.

Legal blocking

Operators may be required to cut off a user's Internet connection, or make it impossible to access certain online content, to comply with decisions issued through a legally authorised procedure, or by order of the courts or a competent administrative authority.

ARCEP reiterates that ISPs are not to take it upon themselves to monitor the legality of the use made of the Internet. Any blocking that falls outside the legally defined framework may be considered discrimination against other undertakings.

Complying with legal obligations, particularly if they allow some leeway on the methods to be employed, do not dispense operators from paying particularly close attention to the secondary, undesired effects of any form of blocking that is not strictly confined to what is necessary. Operators are called on to be as discerning as possible, and apply proportionate measures in response to any orders they receive.

Moreover, if operators allow their customers the option of filtering out certain content – by applying parental controls, for instance – users alone must be the ones to apply the mechanism, by being informed of how it works and being given the ability to remove these filters if they want.

Appendix 9 International context

Debates over the issue of Net neutrality are not confined to France, nor to Europe for that matter. Historically, it was in the United States that the first questions over the internet's neutrality arose in the early 2000s, in particular during the review of the regulatory framework governing telecommunications in the US. Today, the issue is being debated in a number of countries around the globe – with the specific features of the local market determining which facets of the question are considered priorities.

Having recognised its political significance, Community institutions inside the European Union have begun tackling Net neutrality. The European Commission has assigned the Body of European Regulators for Electronic Communications (BEREC) a central role in the process – tasking it with performing an in-depth examination of the topic. At the same time, a great many Member States and NRAs (national regulatory authorities) are devoting efforts on various levels of the issues of transparency and quality of service in particular.

1. Actions being taken in Europe

With the adoption of the new regulatory framework, European institutions defined a general framework that helped starting specific work on Net neutrality, particularly within BEREC. And these institutions have continued to be involved in the debate since then.

a. The European Commission

Following debates over the Telecoms Package, in an appendix to the revised directives and at the request of the European Parliament, the European Commission published a declaration on Net neutrality[127] in which it underscores the importance of the issue and commits to special efforts to monitor it[128].

In April 2011, in a communication on "*the open internet and Net neutrality in Europe*"[129], the Commission provided a summary of the current state of affairs, including existing legal provisions and the work on the issue that is underway, notably within BEREC. The Commission concluded that, although no specific action was necessary at this stage, special attention was nonetheless warranted. It therefore adopted a cautious approach through this communication, one which gives a very prominent role to BEREC[130] as the expert body on the matter.

127 OJEC L 337, 18 December 2009.
128 It begins by stating that, "The Commission attaches high importance to preserving the open and neutral character of the Internet, taking full account of the will of the co-legislators now to enshrine net neutrality as a policy objective and regulatory principle to be promoted by national regulatory authorities".
129 COM (2011) 222 final.
130 Body of European Regulators for Electronic Communications.

The question of Net neutrality has also been addressed by the Commission in high-level efforts to encourage investment in broadband networks, and to thereby achieve the objectives set in the Digital Agenda for Europe[131] in August 2010. The Commission hosted a series of "CEO roundtables" with the heads of the sector's leading companies. Their conclusions[132] did not, however, allow the Commission to reach any real consensus.

The European Commission continues to work on these topics. Two draft recommendations are in the works. The first – announced by Neelie Kroes on her blog and in a memo, and which is based on the work BEREC published in May 2012 – should seek to increase transparency and end users' ability to switch operators, while bringing clarifications to the regulatory framework that applies to traffic management practices. The second concerns the notification procedures for minimum quality of service requirements introduced by national authorities.

b. The European Parliament

Following the Commission's publication of its communication, and in view of the European Council's intention to express itself on the matter, the Parliamentary committee on Industry, Research and Energy (ITRE) began working on a draft resolution. Non-binding, resolution allows the Parliament to express its views on a variety of issues, outside the confines of legislative procedure.

The "*European Parliament resolution of 17 November 2011 on the open internet and net neutrality in Europe*"[133] reaffirms its strong commitment to the basic principles, and goes one step further than the Commission. While noting that "*the conclusions of the Commission's communication indicate there is, at this stage, no clear need for additional European-level regulatory intervention on net neutrality*" (Para. 2), it "*points, however, to the potential for anti-competitive and discriminatory behaviour in traffic management*" (Para. 3) and to "the serious risks of departing from network neutrality" (Para. 11).

It stresses the importance of adopting a consistent approach across Europe, and identifies several specific topics – such as traffic management practices, the interconnection market, etc. – that the Commission should continue to examine. While recognising "*that reasonable traffic management is required to ensure that the end user's connectivity is not disrupted by network congestion*" (par. 15), it urges NRAs to actively protect Net neutrality. It also points to the key role that BEREC plays in this issue, and underscore the importance of having consistent European policies, particularly to be able to react to the legislative initiative taken in the Netherlands.

131 COM(2010) 245 final.

132 The CEO roundtables resulted in 11 concrete proposals being formulated in July 2011, of which three relate to Net neutrality: 1. Europe must encourage differentiation in traffic management to promote innovation and new services; 2. Two-sided business models can be enablers for investment (revenue must also come from CAPs). New wholesale business models could be developed. There should be no a priori restrictions on the development of these business models, provided they are based on commercial agreements, respectful of competition law and non-discrimination principle; 3. the immediate need to encourage open and interoperable standards for QoS-based interconnection.

133 http://www.europarl.europa.eu/sides/getDoc.do?type=TA&language=FR&reference=P7-TA-2011-0511

c. Council of the European Union

With its "*Conclusions on the open internet and net neutrality in Europe*"[134] formally adopted by the ministers during the Transport, Telecommunications and Energy Council meeting on 13 December 2011, the European Council adopted a position in support of a proactive approach to Net neutrality. The conclusions underscore that the Council recognises "*the importance of preserving the open character of the Internet and ensuring the maintenance of a robust best efforts internet for all while respecting fundamental rights*" (Para. 3d).

While asserting that there is no need for legislation at this point, it also points to the need to "*consider net neutrality as a policy objective*" (Para. 5a). It also specifies several concerns that it believes are important to the debate, such as "*discriminatory forms of traffic management and treatment of data [...]; price transparency and quality of service [...]; sustainability of business models of network operators and Internet service providers, due to investments needed to adequately respond to the growing Internet traffic*" (Para. 4c). The text also addresses the issues of interconnection, innovation, investment and technological neutrality, and underscores the role that BEREC and NRAs play in these areas.

d. The role of BEREC

BEREC was created when drafting the new European regulatory framework. Composed of electronic communications regulators from all the EU Member States, it serves as an advisory body to European institutions in the drafting and implementation of regulation in the sector.

BEREC began examining the questions raised by Net neutrality in 2010. In early 2011, the Commission asked the Body to conduct an inquiry into traffic management practices that could have "*negative consequences*" for users, and another into the terms for switching operators. In its communication of April 2011, the Commission detailed and increased these requests, referring to BEREC's investigations into switching conditions and discriminatory practices that will bring to light "*evidence*" of any real issues in the market. This led BEREC to alter the scope, and so the duration, of its investigations (calling directly on operators and other undertakings) which have continued in 2012. Its results, published at the end of May 2012[135], underlined that the most used practices are restrictions to P2P and VoIP on the mobile access and P2P on the fixed access.

BEREC is currently engaged in several actions relating to Net neutrality, most of which have been submitted to public consultation from late May to late July 2012. The goal is to develop a shared understanding of the regulatory issues at hand and to establish a common methodology for addressing them, within the framework set by European directives. These actions, detailed in chapter X of this report, are devoted to the following four topics:

- Transparency: guidelines have been published in 2011 and their implementation is monitored in 2012 (see section 2.1 for more details).

134 http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/fr/trans/126891.pdf
135 http://www.berec.europa.eu/eng/document_register/subject_matter/berec/reports/45-berec-findings-on-traffic-management-practices-in-europe

- Quality of service: a report that details the framework for monitoring quality of service has been published late 2011. Guidelines that specifically address the possibility of imposing minimum quality of service requirements have been submitted to public consultation late May 2012 (see section 2.2 for more details).
- Traffic management: An analysis of the consequences of traffic differentiation practices, in terms of competition and discrimination has been submitted to public consultation late May 2012 (see section 2.3 for more details).
- Interconnection: a report on the current state and changes at work in wholesale internet markets (inter-operator connection) has been submitted to public consultation late May 2012 (see section 2.4 for more details).

All of the NRAs are involved in this work that will form a cornerstone for any of their possible future national initiatives. ARCEP is playing an active role in all of these actions, and leading the way for some.

e. The CJEU

In several recent rulings (see in particular the judgement on Scarlet[136] already mentioned and the judgement Audio Bonner AB[137]), the Court of Justice of the European Union (CJEU) specified the terms under which injunctions aimed at ISPs concerning the filtering and monitoring of downloaded content could be compatible with European Law, and particularly with recent judgements (cf. Appendix 3).

Moreover, in a judgement handed down on 16 February 2012 in the SABAM v. Netlog case, the CJEU reiterated that these principles also applied to injunctions aimed at providers of Internet hosting services – in this instance a social networking platform operator[138].

2. Actions taken in European Union Member States

Of all EU Member States, to date only the Netherlands have introduced legal provisions aimed at framing traffic management practices. Several others have nonetheless begun taking an interest in Net neutrality.

a. Initiative taken by the Dutch Parliament

At a time when the transposition of the new European regulatory framework was well underway, the House of Representatives (lower house) of the Dutch Parliament introduced amendments aimed at forbidding all traffic management practices. The impetus behind the initiative were operators' blocking practices – and particularly incumbent carrier KPN's blocking of applications supplying Voice over IP services, such as Skype, and those enabling users to send SMS via the Internet, such as WhatsApp – and/or that they were billing

136 CJEU, 24 November 2011, C-70/10, Scarlet Extended SA v Belgian society of author's composers and publishers of musical works (SABAM)
137 CJEU, 19 April 2012, C461/10, Bonnier Audio AB e.a.
138 CJEU, 16 February 2012, C-360/10, SABAM v. Netlog NV.

customers extra to be able to use these applications. Operators had developed these blocking practices above all to curtail ongoing revenue losses for their classic calling and texting services.

In June 2011, members of the House of Representatives voted provisions aimed at forbidding internet service providers from blocking or throttling internet services and applications, with four exceptions that were deemed reasonable motives:

- to minimize the effects of congestion, using non-discriminatory techniques;
- to preserve the integrity and security of the network and the service;
- to restrict the transmission of unsolicited communication, provided the end user has given his prior consent;
- to implement a legislative provision or court order.

Operators are also forbidden from billing based on the service being used.

These provisions were approved by the Dutch Senate in May 2012, enabling them to be put into effect.

b. Other legislative initiatives in the EU

Spain requires telecom service providers to publish their main quality of service indicators each quarter, including actual internet access speeds. The Spanish Ministry of Industry then compiles the data which it publishes in a quarterly report.

In Germany, a provision in the bill on transposing the European regulatory framework – which has therefore not yet been adopted – would allow the Government to legislate on general requirements pertaining to non-discriminatory access to information and their distribution, and end users' ability to employ the applications and services of their choice. It nevertheless remains to be seen whether these provisions will actually appear in the transposed law and, if they are, the extent to which the Government makes use of them.

In Italy, several bills on Net neutrality have been debated in Parliament, but no restrictive legislation has yet been adopted. Two new bills were recently introduced, however.

3. Actions taken by NRAs in the European Union

Some of the NRAs in the EU are actively examining the issues raised by Net neutrality, although most only began doing so fairly recently. As with BEREC, the priority for now appears to be deepening their understanding of the issues at hand, and the current state of the market. NRAs therefore have a key role to play here, whether through monitoring, public consultations, enabling self and co-regulatory initiatives with industry stakeholders, sometimes involving consumer associations, implementing measurement tools, especially for quality of service, or drafting recommendations and guidelines. It nevertheless appears that most NRAs do not plan on setting minimum quality of service requirements, as is now permitted by Article 22.3 of the Universal Service directive – at least not in the near future. One final thing worth mentioning is that several NRAs in the EU are not engaged in any specific actions on Net neutrality.

Below is a selective look at some of the approaches to the issue being taken by NRAs in Europe.

a. The United Kingdom

British regulator Ofcom has been devoting major efforts to Net neutrality for two years now. In June 2010 Ofcom published a discussion document on "*Traffic management and net neutrality*"[139], inviting all stakeholders to comment. Ofcom has also hosted bilateral discussions and organised or taken part in various events on the topic.

The results of these efforts were summarised in a report on "*Ofcom's approach to Net neutrality*"[140], published in November 2011. The document underscores the importance of consumer information, and of preserving best-effort access. It begins by saying that Ofcom believes that competitive forces are currently strong enough to protect Net neutrality, but notes that it is still necessary to keep a close watch on the market's development as problems could arise in future. Ofcom stresses the importance of allowing users to switch ISPs, and of consumers having clear and understandable information on traffic management practices. This information must include at least the following elements:

- information on average speed that indicates the level of service consumers can expect to receive;
- information about the impact of any traffic management practices used on specific types of services, such as reduced download speeds during peak times for P2P software;
- information on any specific services that are blocked, resulting in consumers being unable to run the services and applications of their choice.

Ofcom welcomes the self-regulatory model developed by the UK's main ISPs which have committed to:

- provide more information to consumers about traffic management practices why they occur and with what impact;
- provide customers with clear, easy-to-understand information on traffic management so that they can better compare broadband packages, and
- publish a common Key Facts Indicator (KFI) table, summarising the traffic management policy for each package on offer.

The British regulator is nevertheless calling on industry players to work on how, based on this table, to supply consumers with more easily accessible and understandable information.

Ofcom also recognises the benefits of both best-effort internet access and specialised services, and are working to ensure their coexistence. The regulator is closely monitoring these issues which it will address in the work being done on its upcoming status report on communication infrastructures in the UK – with an update due to be published in summer 2012. Ofcom has nevertheless stated that "*any blocking of alternative services by providers of internet access is highly undesirable*". While recognising that some forms of traffic management can be necessary to handle network congestion, the NRA nevertheless considers that such practices must apply to categories of traffic as a whole and not to specific competing services, which it believes could have a similar impact to outright blocking. Lastly, Ofcom stated that should "*the current blocking of services by mobile operators [remain] both widespread and persistent,*" it would need to "*consider whether the benefits of intervening outweighed the risks*".

139 http://stakeholders.ofcom.org.uk/binaries/consultations/net-neutrality/summary/netneutrality.pdf
140 http://stakeholders.ofcom.org.uk/binaries/consultations/net-neutrality/statement/statement.pdf

On the matters of both best-effort access and consumer information, Ofcom therefore concluded that market forces are currently strong enough to preserve them but that it was necessary to continue to monitor the market's progress closely and, if necessary, take more restrictive measures, including setting minimum quality of service requirements. In its provisional work programme for 2012, Ofcom announced additional work on consumer information and gathering information on the supply of best-effort access, while keeping open the possibility of taking more formal measures should they prove necessary. The British regulator will also continue its dialogue with stakeholders.

b. Italy

In 2011, Italy's national regulatory authority, AGCOM, conducted two public consultations: one on Net neutrality in general and one on VoIP and peer-to-peer services on mobile networks – the results of which were contained in two reports published in late 2011. AGCOM plans on continuing and deepening its efforts over the course of 2012, particularly those devoted to traffic management, transparency, and competition and interconnection issues.

The Italian NRA has also had a measurement and monitoring system in place since 2008 which is based on a downloadable application[141] and an infrastructure dedicated to testing connection speeds. The goal is to provide both internet users and the regulator with a global and accurate view of every ISP's performance on each type of access technology (xDSL, cable, FTTH). The data are measured both by ISPs (on lines dedicated specifically to tests) and by users (using the downloadable software). Work has also been ongoing since 2010 on rolling out similar tools for measuring mobile internet access services.

AGCOM has also been working since mid-2011 on a tool that would enable users to obtain information on all of the wireline and wireless internet access products available in a given geographical area. Lastly, in 2009, the NRA introduced an accreditation scheme for online price comparison engines for electronic communication services.

c. Germany

Germany's national regulatory authority (Bundesnetzagentur) has launched a study for measuring the quality of broadband connections, and verifying compliance with the principles of neutrality. This study is using dedicated lines and is examining means for allowing end users to monitor the quality of their connection in terms of bandwidth and possible application specific deterioration[142].

The study which will take place during the second semester of 2012 is available online to enable the users to test their lines with their own equipment.

141 https://www.misurainternet.it/
142 http://www.initiative-netzqualitaet.de/startseite/

d. Denmark

Denmark's national regulator, NITA, is encouraging the industry to take an active role in guaranteeing Net neutrality. The chosen approach is based largely on voluntary commitments from industry players and, although it continues to monitor the market, NITA does not plan on taking any restrictive measures for now.

As an adjunct to the transposition of the European framework into national law, the Danish IT and Telecommunications Agency has published guidelines stating that ISPs are responsible for ensuring users' rights with respect to Net neutrality. The NRA can only intervene if the industry fails to guarantee neutrality on its own. Following publication of these guidelines, one of the country's major industry federations created a Net neutrality forum that brought together other federations, individual ISPs and consumer associations. NITA has the status of observer and the forum delivers an annual report on its work.

On the matter of transparency in traffic management, in 2011 the industry adopted a code of conduct on neutrality. It stipulates that users must have access to information on the traffic management practices being used by ISPs. Another code of conduct on the way in which internet access services are marketed states that users must be informed of the possible uses of a given connection – such as the ability to watch television or videos.

As concerns quality of service, NITA has created an online instrument for measuring internet access services that allows users to obtain information on the speed and quality of their connection.

e. Hungary

Hungary's national regulatory authority, NMHH, is beginning to explore the Net neutrality question. In 2011, it issued two measures that include specific provisions on transparency. In 2012, NMHH is due to conduct a public consultation and create an observatory on the quality of internet access services in tandem with ISPs. Here too, the goal is to provide both end users and the regulator with comparable and understandable indicators on any ISP and any technology. The Hungarian NRA is also producing a report on ISPs' traffic management practices and, depending on its findings, could decide to issue guidelines on the matter.

f. Finland

In regulation issued in 2009, Finland's NRA FICORA, obliged operators to avail themselves of the means to measure the quality of their services should the need arise. FICORA also recommended (but did not require) operators to provide end users with instruments for measuring the quality of their connection. Meanwhile, the Ministry responsible for electronic communications issued a decree setting minimum quality of service requirements for some, but not all, internet access products.

g. Latvia

In late 2009, Latvia's national regulator, SPRK, adopted a regulatory decision that classifies all internet access services into one of 12 categories, depending on their upstream and downstream bandwidth. Every year, the country's ISPs must provide the NRA with a statement detailing six parameters for each category of service: average bandwidth, average download time and delay, average latency, average packet loss, average line repair time, average service availability. The following year, ISPs must provide the NRA with a report that compares that year's results with those of the previous year. The statements and reports are published on the SPRK website, which allows end users to access these QoS indicators and so compare the different ISPs. When setting the terms and conditions attached to general authorisations, in 2007 SPRK also required ISPs to include specific QoS requirements in their service contracts with end users, including guaranteed (upload/download) speeds, service availability and repair time – as a way to protect consumers.

h. Romania

In 2011, Romania's national regulator, ANCOM, adopted a decision that requires operators to publish, and include in their service contracts with end users, a series of QoS indicators – maximum bitrate, guaranteed bitrate, connection establishment time – to allow users to compare the different internet access products available.

4. State actions outside the European Union

The Net neutrality debate has also grown in scale in a number of countries outside of Europe. Also worth noting in a broader context is that the internet's role in society was discussed at the first ever eG8 conference that was held in Paris in May 2011, in the run-up to the G8. Its conclusions offered a reminder of the internet's political, social and economic role, hence the importance of promoting fast, free and open access to it and, of course, of achieving the right balance between regulation and freedom.

Below is a look at the status of debates on the issue in three countries: the United States, Canada and South Korea.

a. The USA

The Net neutrality debate began in the early 2000s in the United States, at a time of massive deregulation of the ISP business – regulation of wholesale broadband internet markets had been lifted – and its impact was felt all the way to Europe. In a policy statement issued in 2005, American regulator, the Federal Communications Commission (FCC), published the four guiding principles for healthy regulation:

- consumers are entitled to access the lawful Internet content of their choice;
- consumers are entitled to run applications and use services of their choice, subject to the needs of law enforcement;
- consumers are entitled to connect their choice of legal devices that do not harm the network;
- consumers are entitled to competition application and content providers.

It was based on these policies that the FCC investigated the country's largest cable company, Comcast, and in 2008 concluded that it was engaged in abusive traffic management practices. While accepting to change these practices, Comcast nevertheless went to Court and successfully challenged the FCC's power to regulate broadband services.

Faced with the need to reassert its role in this area, the FCC drafted a decision on "*Preserving the Free and Open Internet* ",[143] which came into effect in November 2011. This set of rules, which draw and build on the principles set out in 2005, comprise three core principles:

- Transparency: Fixed and mobile broadband providers must disclose the network management practices, performance characteristics, and terms and conditions of their broadband services;
- No blocking:
  - Fixed broadband providers may not block lawful content, applications, services, or non-harmful devices;
  - mobile broadband providers may not block lawful websites, or block applications that compete with their voice or video telephony services;
- No unreasonable discrimination: Fixed broadband providers may not unreasonably discriminate in transmitting lawful network traffic on the internet access of a consumer.

The FCC justifies treating wireline and wireless network traffic differently by arguing that the mobile internet is a new and still developing market.

Even though the regulator now has a set of strict guidelines, they are still very much disputed. Those in favour of neutrality criticise them for not going far enough, and not protecting users enough. The laissezfaire camp, meanwhile, finds them too stringent and says they will stifle innovation on the internet. They also continue to argue that the FCC does not have the power to rule on the matter. The debate continues to be very lively, and a change in regime following the upcoming Presidential election could once again cause a shift in the landscape.

b. Canada

Canada's national regulator, the Canadian Radio-television Telecommunications Commission (CRTC), was a pioneer in Net neutrality regulation. In 2009, it published an assessment of ISPs' traffic management practices[144] which also constituted official guidelines on the matter. The current system has nevertheless been criticised in some corners in terms of its mode of application, namely the fact that it is based on user complaints and not on proactive investigation by the NRA.

143 http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-201A1_Rcd.pdf
144 http://www.crtc.gc.ca/eng/archive/2009/2009-657.htm

c. South Korea

Net neutrality is a source of growing concern in South Korea. In an environment marked by an explosion in traffic, especially on mobile networks, carriers are now having to contend with the development of new types of services, such as VoIP and connected TV, travelling over their networks and which they believe undermine their business models, namely the supply of unlimited bandwidth at a very low price. Up until now, the country's regulatory authority, KCC, has not voiced any official stance on Net neutrality, but it is involved in work on the subject being performed by public institution, KISDI (Korean Information Society Development Institute). In November 2010, KISDI adopted a document which, although it has no legal or regulatory status, could qualify as preliminary guidelines for the sector. They contain several overriding principles that are relatively similar to those that have been laid out in other parts of the world. Among them are obligations such as:

- transparent traffic management: operators must inform consumers of the terms and conditions of their traffic management practices, and particularly any restrictions and/or limitations imposed on their traffic;
- relevance and proportionality: the shaping or throttling of traffic must be justified by recognised constraints, and be proportionate to the management of these constraints. Throttling and any other special measures taken to manage network traffic must therefore be exceptional;
- non-discrimination: all data traffic must be treated in an identical fashion, regardless of origin and destination.

Beyond these principles, the KISDI guidelines nevertheless consider that certain limitations could legitimately be implemented through the technical and/or economic management of network traffic. This would include, for instance:

- restricting behaviour that would damage the network's integrity (e.g. DoS attacks, viruses, spam, etc.);
- responding to an urgent or temporary surge in network traffic;
- restricting behaviour that involves the unauthorised distribution of copyright protected files;
- responding to public safety issues or national emergencies, etc.

These guidelines also stipulate that when carriers market specialised services separately, which guarantee customers a given level of quality of service, this must not be at the expense of the quality of the unspecialised internet streams, in other words those delivered using a best-effort approach.

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