ISOC Portugal Chapter position on “The future of the electronic communications sector and its infrastructure”

Internet Society

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Answer of the Portuguese Chapter of the Internet Society to the European Commission Public Consultation on “The future of the electronic communications sector and its infrastructure”

1. Introduction

This document contains the response of the Portuguese Chapter of the Internet Society to the European Union consultation of 23 February 2023 entitled “The future of the electronic communications sector and its infrastructure” (https://digital-strategy.ec.europa.eu/en/consultations/future-electronic-communications-sector-and-its-infrastructure).

Following this introduction, section 2 presents a brief historical analysis of how the Internet has evolved over the past 25 years. This analysis shows that the telecommunications infrastructures which currently support the Internet, went through several (r)evolutions, backed by, during that period, significant investments. These investments were fully paid by the customers of the operators and the current infrastructures are now able to support the capacity and quality of service needs of the most demanding applications currently on the market. Furthermore, the Internet ecosystem has evolved within a regulatory framework, and relations among the different actors, which has been able to accommodate the technological evolutions and the related investments that have taken place up to now.

It follows that there are no reasons to a priori believe that the existing regulatory framework is an impediment to new developments and new applications, if these are based on and made possible by markets needs.

Then, in section 3, a brief analysis is made of how the market for Internet access networks can be nowadays characterised. This is the market in which operate telecommunications companies that provide public access services to the Internet. This analysis is followed by a brief characterisation of

the markets in which Internet content and application providers operate. The most important differences between the two eco-systems are then highlighted.

In the same section it is also shown that it is not possible to establish a direct relationship between financial margins and network capacity consumption in access networks. On the other hand, establishing new fees to be paid by content and application companies would be strange, when in fact users of access networks already pay for the network capacity consumed by the applications they use.

Section 4 contains an analysis in which it is shown that the new tax, which would be an eventual intervention by regulators in disputes between private companies, may result in a situation in which the public at large, and companies not directly involved in these disputes, are the most affected. Furthermore, this intervention has no guarantee, even minimal, of contributing to a healthier and more virtuous evolution of digital markets, or of contributing to the development of new applications, since higher margins do not directly translate into higher investments (or price lowering) as seems to be current economy empirical knowledge.

On the contrary, the interventions suggested by the telecom companies that motivated the consultation, constitute a violation of the neutrality (of networks) vis-à-vis the content transported by the public access communications infrastructures, and would give the companies that control these infrastructures a capacity to intervene in competition, innovation and functioning of future applications, by being able to artificially extract advantages from the innovation and services others are responsible for, only because they own or control these infrastructures.

By defending this point of view, we are not considering that the markets of content and applications business are perfect. Unfortunately, the situation, at least in some of these markets, is exactly the opposite, but that's another subject of discussion.

Finally, in section 5, without intending to try to foresee the future, some suggestions are presented on how States intervention can become more profitable for the public and all kinds of companies at large and may contribute to healthier Internet access markets. That part of the document is presented just as an alternative path to the current debate.

2. Internet evolution during the past 25 years - current situation and lessons from this evolution

After a long maturation, the Internet, in 1998, was no longer a simple academic curiosity, looked with disdain by telecommunications companies, almost all of which were incumbent, oriented, until then, only to the exclusive sale of voice services. On the contrary, it already had become a new reality, which some sectors already saw as revolutionary, and to which the telecommunications of the future would have to converge. In Portugal, the excitement was already significant, and the incumbent, Portugal Telecom, had also already decided to enter the Internet access market.

However, the Internet at the time worked using features of the telephone network: access through voice channels over analogue telephone lines, and network backbones using digital channels diverted from the transmission of telephone calls over long distances.

During these 25 years, global telecommunications infrastructures, today fully optimised for data transmission, have evolved through successive technological mutations. First, the analogue telephone

access channels were replaced by DSL (DSL – Digital Subscriber lines), a way of reusing telephone copper wires for digital data transmission. In parallel with this reuse of telephone wires, the reuse of coaxial cables of cable television networks for digital data transmission also began. The next wave was the replacement of both types of copper wires by optical fibres. In Portugal, for example, 500 Mbps fibre-based home fixed access capacities are now commonplace in all moderately sized cities. This is an increase of 10,000 times over the home fixed access capacity available in 1998.

At the same time, progress was made in the networks backbones, namely in terms of optical transmission, which has now reached a level where a single pair of optical fibres supports transmission at 400 Gbps, on a single wavelength, and potentially support a simultaneous set of wavelengths that allow an aggregated capacity of 8 Tbps on a single pair of optical fibres. That is, the capacity of backbones has increased at least more than 200,000 times.

The mobile telephone system has also been greatly improved, and, already from the 4G generation onwards, it allows data transmission at a few tens of Mbps. The same happened with the successive generations of WiFi, which allows mobile communications at short distances that easily reaches bit rates of 100 Mbps. These are capacity multiplication factors of the order of magnitude of those experienced by fixed communications. New low earth orbit satellite communications operate at the same range but have yet a restricted coverage.

This evolution not only corresponds to a revolution in the economy of data networks, it allowed the transition from a situation in which data communications were expensive and rare, only activated in situations where it was strictly necessary, to a situation in which the transmission capacity of data is plentiful and has an almost continuous availability.

At the same time, the operation of the network was standardised, with the protocols and technologies supporting Internet applications becoming dominant, integrating both the telephone network and the television networks functions into the same data transmission technology. Telephone calls and television broadcasts become two new more applications among the many now supported by the new network. This technological continuity has introduced new factors of scale and optimisation of network management, which allow for a significant reduction in management and maintenance costs.

Thus, from a situation in which there were three different networks in parallel: telephone, television and data, we now have a situation in which a standardised network, whose capacity has grown hundreds of thousands times, simultaneously supports the equivalent to all traditional services, plus another varied range of new services, which take advantage of an abundant transmission capacity, and were designed in order to provide a high level of interactivity and interaction well known nowadays to the general public.

At the same time, a complex and difficult-to-solve problem, the network's quality of service, has been made mostly irrelevant, as the continued and unstoppable rise in network capacity has been accompanied by an increase in the computational power installed close to users. Both factors, taken together, explicitly or implicitly, ended up making almost irrelevant the eternal discussions about how the applications required quality of service can be provided at network level. In fact, in short-distance networks, with plenty of capacity, quality of service is simpler to provide.

Communicating over the Internet is not a rare event, using a scarce resource, it is a practically constant possibility, based on an abundant resource, at least in urban areas with a high density of consumers.

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Comments on the “The future of the electronic communications sector and its infrastructure”

Until the beginning of the 21st Century all Internet communication infrastructures were managed by telecommunications operators (telcos). The public paid the network access telcos (Tier-3 operators) a connection fee, which they used to pay for their operations and investments and to pay the transit telcos (Tier-2 and 1) for the transit services required to provide global connectivity across all of the Internet. The content and application providers (CAPs - Content and Application providers) also paid the telcos for their connection to the network (also through connection fees). Some users also paid CAPs for some of their services.

With the popularisation of applications with millions of users, some CAPs started to invest directly in Internet telecommunications infrastructures: in POPs (POP - Point of presence), with servers close to the users, in data centres with massive computing capacity and memory, and in direct interconnection backbones connecting their POPs to the data centres, and also to directly interconnect their data centres. Nowadays, the majority of very long distance (submarine) optical cables capacity does not serve Tier-1 and Tier-2 telcos, but rather serves, directly or indirectly, the larger CAPs. CAP POPs, data centres and long range network capacity investments were also paid for by users, through direct service fees, but also, indirectly, through advertising revenue, what also translates to indirect users payments.

The interconnection between the networks that make up the Internet generally takes place according to two types of relationships. The first is that of provider-consumer, when the former provides communication capabilities to the latter, generally providing full worldwide Internet connectivity, and the latter pays for this service to the former. The second type of relationship is called peering, when interconnection is in the mutual interest of both operators in directly exchanging traffic directed to and originating from their two networks. In this case, the peering contract generally does not give rise to payments. Many CAPs have installed POPs with servers next to, or inside, the infrastructure of access (Tier-3) telcos, and established interconnections with these, given the mutual benefits, based on non-paid peering relationships.

Today's telco access networks carry infinitely more data between CAPs and end users, but this data is nothing more than the data requested by users when using Internet applications that consume network capacity. Indeed, the initiative for transmitting this data does not belong to the CAPs, but to the users who request it and for whose access they already pay the telcos access fees.

Most long range content transmission is nowadays made inside the private CAPs networks, and indeed, most of the traffic is requested by users who have to receive services from the CAPs and, in this way, many applications are nowadays served directly from the POPs of the larger CAPs. The net result is less network transit time and better quality of service, but it is also saving telcos from this traffic overloading their transit connections, which they would otherwise pay to Tier-1 and 2 telcos, what would be their main network bottleneck factor.

This is also the current situation in Portugal, where the majority of Internet traffic requested by users from the largest CAPs is served from their POPs, directly installed near or inside the access networks of the telcos from which users contract Internet access services.

In summary:

- **In the last 25 years there has been a significant (r)evolution of the set of telecommunications infrastructures of telcos and CAPs, whose capacity has grown up hundreds of thousands of times.**
- **There was also the development of a very significant set of data centres and POPs owned by CAPs, close to the users and connected to them through the telco access networks. CAPs POPs and data centres are interconnected by CAPs private networks, independent of those of telcos.**

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- **The set of these telcos and CAPs owned infrastructures has a large capacity and adequately supports the operation of current applications, at least in urban areas with a high density of consumers.**
- **The interconnection of POPs and access networks is generally based on a non-paid peering policy given the mutual benefit for access telcos and CAPs.**
- **Traffic injected by CAPs into access networks is injected in response to service requests sent by end users. That is, the CAPS only inject traffic into the telco networks in response to user requests, as the latter do not even use the telco networks to interconnect their data centres and POPs.**
- **Users already pay for the traffic generated in response to their requests to the access telcos, through network access fees, which, in the case of mobile networks, are generally proportional to the traffic received and sent.**
- **In 25 years, the investments made were only financed by services sold to users by telcos and CAPs. There is no news of the need for States to save any of the telcos that provide public Internet access services from bankruptcy.**
- **All the significant subsidies granted by the States were mostly aimed at enabling the development of infrastructure for access telcos in areas where consumers are more sparse.**
- **The interconnection model of the thousands of networks that make up the Internet has always been based on mutual agreements between the different agents, based on mutual benefits, advantages, dependencies, exchanges of services or payments, without any significant regulatory intervention.**
- **That is, the existing interconnection model was compatible and allowed for the necessary investments and developments to reach the current situation.**

3. Network access and CAPs markets and regulatory intervention in them

It is now generally accepted that access to the Internet should be a fundamental right for all. Furthermore, the access of companies and the possibility of existing connections that support all types of public and private services is also critical for the competitiveness of economies and for the promotion of citizenship in general.

Public access to the Internet is essentially based on public access networks, generally managed by telcos. Exceptions, such as new low orbit satellite networks and public access WiFi infrastructures, do not significantly alter the discussion that follows.

Since access to the Internet is a fundamental right, it could be provided by state-owned companies, or by a mix of state-owned and private companies. Generally, the model currently adopted in the Western World is that of a collection of private companies operating, mostly private, network infrastructures. This market would not need any significant regulation if it were a market where it was easy for new companies to enter, competition was significant, and it was easy for consumers to choose a different supplier.

In fact, this is not currently the case. Access networks use scarce resources and involve large investments. In the case of mobile access, this scarce resource is mobile communication frequencies and base stations, which are generally allocated by auction to a small group of competitors. Given the significant investments required, those companies receive these licences for very long periods. The same goes for fixed accesses. As it is not feasible to connect neighbourhoods with many parallel fibre networks, that means that the number of companies with infrastructures for fixed Internet access is

very small. In fact, in Portugal, for example, dozens of years go by without the appearance of new access telcos with owned infrastructures.

As a result of this situation, the Internet access market is satisfied by a small number of companies and the emergence of new telcos, providing access based on their own infrastructure, is quite rare, as these companies operate an infrastructure that requires a lot of investments and which, using only income from the sale of network access, have a medium to long-term financial amortisation rate. There are the so-called virtual telcos, who resell access based on infrastructure from other telcos, but this reality does not change the main conclusions of the discussion that follows.

Due to these characteristics, the telcos that operate in this market seek to introduce complementary service that allow them to increase their margins, that is, services characteristic of CAPs. The most common complementary services are access to television channels, telephone service and even, nowadays, streaming services.

For example, to force the purchase of their complementary services, telcos in Portugal sell an Internet connection, without complementary services, for a cost that is close to the cost of a bundle that also includes access to more than an hundred channels of television, telephone service and even some streaming services.

On the other hand, in the fixed market, the difference in the cost of access when the connection capacity is increased from 100 or 200 Mbps to 500 Mbps only corresponds to an increase of around 10%, which shows that the connection capacity access to the Internet is not, by itself, a determining factor in establishing the price of services. The duration of the contract, however, is a determining factor for the profitability of these infrastructures, that leads Portuguese Telcos to practice loyalty contracts of two years in general. If users end these contracts, they are obliged to pay high penalties.

The services provided as applications over the Internet are very varied. Theoretically, competition in these markets is easy, as there is a high degree of flexibility in introducing new services and new competitors for established services. In practice, due to scale effects, capital market investment strategies, and also the private appropriation of individual and public data, there is a very significant degree of monopolisation in some services and, due to this concentration of market power, some CAPs exhibit very high financial margins.

Another facet of this market is that there is no direct relationship between the CAPs' margins and the traffic they inject into access networks in response to requests from their users. There are also numerous services provided with reduced finance fees, or even offered on a non-profit basis (e.g. Wikipedia) and this is independent of the traffic required to support them. The cases in which high margins coincide with high traffic are, in general, restricted to social networks, as streaming services are far from an high level of monopolisation and diversity seems to be the rule, at least for the moment.

We can thus characterise the situation in these two types of markets as follows.

- **Developing Internet access infrastructure requires significant investments, forms of licensing that cannot be offered in large numbers and is an operation reserved for a small group of companies in each geographic area. These operations are generally highly regulated, and are an inflexible market when it comes to competition. Reimbursement of investments in these infrastructures generally lasts several years.**
- **Developing services at the application level (telephone service, voice messages and other messaging services, television channels, content distribution, streaming, social networks, email, games, etc.) is relatively easier and more flexible, so there can be many providers and large**

competition and, for these reasons, little or no regulation of competition seems or seemed to be necessary (regulation at large of these markets is another discussion that goes beyond this text).
- **However, due to several internal and external factors, in some of these services there is a high degree of monopolisation and high financial margins.**
- **Also, there is no direct and clear relationship between the network capacity required by services users, and the degree of monopolisation, marketing margins, etc. of the same services.**

4. Criticism of the “sender-pays taxes” proposal

To begin, it is important to recall, see section 2, that the previous 25 years of the history of the evolution of the Internet show that the current interconnection model and regulatory framework didn’t prevent at all the huge private (and also public) investment in the significant and revolutionary evolution of the Internet, and the applications that it supports nowadays.

The “sender-pays taxes” proposal is presented as a new way of financing investments in access networks (not other types of network infrastructure since these are mostly controlled by the CAPs nowadays), and seems to have as background the difference in margins of different business activities.

On the one hand, see section 3, there is the business of access networks, requiring high investments, which can only be amortised over medium to large periods, in markets which, by their nature, have to be regulated. On the other hand, there are all the other businesses provided at the content and application level, in which, at least some of them, because they currently have high levels of concentration, have higher financial margins and attract huge investments from the capital markets.

The proposal intends to divert part of the margin from CAPs that provide applications with higher network capacity requirements to access telcos. However, on the one hand, there is no direct correlation between margins and access network capacity needed by applications and, on the other hand, given that we are, in both sectors, dealing with private companies, what sense does it make for the regulators to be interfering in the redistribution of margins, when not even network capacity is an (indirect) measure of these margins?

However, reducing the issue of application services to high-margin services is a very partial view. Today, an infinity of information depends on the Internet services, which require very varied network capacities, and which have very different importance for the public and for the functioning of the economy.

Favouring the business model and margins of Internet access companies, giving them the ability to simultaneously provide application services, in competition with other actors whose businesses are dependent on access, and simultaneously giving them the possibility of charging taxes based on traffic, which is already being paid for by its access customers, is to complicate an already complicated problem, without showing what problem for the general public, the economy and the markets is really being solved.

How can regulators guarantee that this extra income will be used to invest in new infrastructure where it is most needed, namely the sparsely populated regions, which access is already subsidised by the EU for example?

Furthermore, in practice, it will introduce distinctions among the availability and price of different services based on competition and commercial reasons. Will telcos pay themselves for the network

capacity used in their own, or their partners, CAP-like services? What happens to the access of services of CAPs that do not want, or cannot, pay the new taxes?

In fact, such a proposal corresponds to increasing the margin of the access business, giving its agents, already few in number, and operating in a market where it is difficult to introduce competition, the possibility of them to control, influence and distort the markets dependent on them. This is a clear sign of network neutrality violation.

This proposal is dangerous and in the long run can have harmful effects:

- **On the one hand, users will start paying in duplicate for the required traffic for some of their applications to work: first, they will pay for that traffic to the access telcos, and then, directly or indirectly, they will pay it again to the CAP operators, as these companies will not watch their margins drop without reaction.**
- **If these rates are significant, it will be very likely that the larger CAPs will decide to enter the access business by, for example, acquiring stakes in telcos, which will further increase the already existing degree of concentration in the market.**
- **What will happen to all the CAPs that do not accept these new taxes, or that do not have the capacity to support them? Will they stop providing their services to users using the telcos that impose the fee? What about a CAP type of service provided on a non-profit basis?**
- **How the multitude of contracts and particular cases that the proposal implies, even between entities with no direct relationship with each other, will be managed? For example, a CAP based in Brasil, contracting caches in several European data centres, that intends to provide services in Europe?**
- **What sense does it make for regulators to interfere in the allocation of margins among the different actors?**
- **How to manage the advantage that telcos have over the competitors when they enter the CAP market using their own access networks and their direct channel to their customers?**
- **What sense does it make for telcos, who control the access networks, and already provide services characteristic of the CAPs, to interfere in the CAPs markets in a clear violation of the neutrality of the access networks?**
- **Can the telcos, owners of public access networks, be in a situation that conditions public access to the services of the different CAPs, privileging some to the detriment of others, in a clear violation of competition rules and network neutrality?**

5. What kind of market interventions may be justified?

So far, in most of the Western world, the model adopted to develop the telecommunications infrastructures necessary for the Internet to function, has been to give this responsibility to private companies. With some regulation, in the case of access networks, and with little or no regulation, in the remaining parts of the infrastructure. The question that arises is whether or not there is a need to change this model?

The last 25 years have shown that when these infrastructures are developed in response to real market needs that users are willing to pay for, there is viability for further development and upgrade (e.g. 5G) of these infrastructures, at least in the regions with an high degree of concentration of users.

Whenever this condition was violated in the past, there was usually an enormous waste of private (e.g. dot com bubble) or public capital (e.g. public subsidies wasted because they did not result in anything clearly innovative and visible at a technological or market level).

Taking into account the required capillarity, which translates into a much larger number of base stations, the investment for the development of 5G mobile networks is very significant. However, it is fair to question whether the most important applications of this new infrastructure will be applications consuming large network capacity.

Consuming streaming or equivalent services on a mobile phone screen, even if popular, does not require a huge network capacity, especially if access networks are complemented with caching and multicasting mechanisms (which access operators could even develop to sell to CAPs). When the terminals are fixed, or mobile but close to places with public WiFi access, there are already viable alternatives to 5G.

That is why it is, at the very least, prudent to question whether the development and generalisation of 5G is a necessary condition for the development of the business of current CAPs that are simultaneously large consumers of network capacity. It is not obvious at all.

With regard to other new applications (e.g. metaverse, autonomous driving, etc.) that consume a lot of data and need low transit time (latency), it still remains to be proven what their economic viability is, or at least how much will users be willing to pay for them. As far as online games and IoT services are concerned, it is not clear whether their viability depends only on network capacity, or whether their development will not mainly require other computational support closer to the end users, along with a modest increase in the capacity of the network. It is equally questionable whether IoT applications will be the main consumers of network capacity. Several other prospect applications requiring large network capacity, e.g. remote surgery interventions, seem more viable in fixed settings than in mobile ones.

So, the future needs of the different applications and their viability on the market are far from being cristal clear. Moreover, it is quite likely that the development of new applications demands more and more new computational capacities near end users, and not necessarily, or at least not only, greater network capacity.

Today, as practice has clearly shown, telcos have been little or not at all responsible for the development of these new edge computational capacities, nowadays totally confined to the data centres and POPs of the biggest CAPs or confined to data centres of other actors. In fact, software and computing is far from the DNA of telcos.

Whichever way we look at these new applications, their development does not seem to be a priority for the States, nor does it seem to us that public resources should be consumed in the development of the network infrastructure they may, or not, need. Also, the correlation of their economic margins with the volume of data they generate is not immediate. Are CAPs waiting for 5G to develop their businesses? Nobody can be sure of the right answer.

Some observers have even pointed out that the financial surplus released by the telco business have not been used for investments, but rather to buy their own shares or to distribute more dividends to their shareholders. That is, the telcos are not revealing an huge appetite for developing their businesses and investing in them, or in new ones related to the CAPs markets.

There are, however, two concerns that should be the subject of public intervention. On the one hand, it seems to make sense to relieve telcos of some of the regulatory imposed coverage obligations in

regions with low consumer density (generally met with great deficiencies), either because their density is effectively low, or because their purchasing power is low.

On the other hand, given that it is more complicated to introduce competition in the access market, or enter into a complex process of regulating the entry of telcos into the CAPs market, **it is desirable to create public access infrastructures, even by being these concessions to private parties, on top of which virtual access operators can offer services in regions with low density of customers.**

In fact, it seems reasonable to think that there are limits to fully entrusting the development of Internet access infrastructures to private companies since, inevitably, everything indicates that this market is unable to function properly without strong public intervention and regulation: on the one hand, these companies are required to abide by rules that limit their margins, but on the other hand, they are required to take on greater responsibility (coverage, net neutrality, technological suitability, preventing unfair competition, etc.).

Everything indicates that the Internet access market should evolve into a market treated in a similar way to the one of energy access networks, that is, a market in which there is a reduced number of shared concessionary infrastructures connecting homes and terminals to the network. That is, a situation where there is, in each region, a set of price regulated and controlled infrastructure providers that only sell services to virtual operators, which in fact are the ones who sell services to the public.

It is in this type of transitions that, in our opinion, States should focus their energies.

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