EXPLORATORY CONSULTATION ON THE FUTURE OF THE ELECTRONIC COMMUNICATIONS SECTOR AND ITS INFRASTRUCTURE

Summary Report on the results of the exploratory consultation

Disclaimer: the views presented in this factual summary report are not the views of the European Commission, but those of the stakeholders that participated in this exploratory consultation. It cannot be regarded in any circumstances as the official position of the European Commission or its services.

The exploratory consultation on the future of the electronic communications sector and its infrastructure ran from 23 February to 19 May 2023. It aimed at gathering data on the technological and market developments, fairness for consumers, barriers to the Single Market and the fair contribution by all digital players benefitting from the digital transformation.

Although there is no obligation under the Better Regulation rules to prepare a summary report following an exploratory consultation, the Commission is committed to the principle of transparency and makes public this factual summary report summarising the views of the respondents.

A. Objectives of the Consultation

The Commission launched an exploratory consultation on the future of the electronic communications sector and its infrastructure to gather views on the changing technological and market landscape and how it may affect the sector. It aims at identifying the types of infrastructure and the investments that Europe needs to lead the digital transformation in the coming years.

The exploratory consultation consisted of 62 questions, both "closed" (multiple choice questions which allowed the respondent to also add other answers, and to explain the choice) and "open" ones (free text) covering 4 areas: (i) technological and market developments, (ii) fairness to consumers, (iii) barriers to the single market and (iv) fair contribution by all digital players. In addition, respondents had the possibility to upload a submission, to complement the reply and bring to the Commission's attention any other considerations considered relevant. The consultation was open to any stakeholder.

Respondents were not required to reply to all questions; therefore, the sample size of the answers varies between and within sections. For this reason, in the following, for each topic, the percentage indicated reflects the share of the actual respondents to the specific question or, where the percentages are not representative due to the small sample, the qualitative wording is provided.

B. Who replied to the consultation?

The Commission received 437 responses to the consultation and 164 position papers. 108 contributions were submitted by companies, 87 by business associations, 124 by citizens (114 by EU citizens and 10 by non-EU citizens), 47 by non-governmental organisation ("NGOs"), 16 by research / academic institutions, 14 by consumer organisations and 5 by trade unions. In addition, 17 public authorities provided feedback, representing a mix of bodies with different scope, such as European (2), national (13), and regional/local authorities (2).

As regard the country of origin of the respondents, the large majority of the replies (85%) came from EU Member States. The remaining replies came from stakeholders outside the EU, mainly from the United States (7,7%) and the United Kingdom (2,7%).

C. Summary of the Results

1. Technological and market developments impact on future networks and on business models for electronic communications

a. Technological and Market Developments

There is large agreement, and even a sense of urgency among some stakeholders, of the importance of the new technological developments for the future of the connectivity sector and more broadly for fostering the European economy, ensuring Europe takes a leading role on the digital transformation, protecting its sovereignty and contributing to the EU environmental and sustainability objectives.

i. New Technologies impact on the connectivity sector

Overall, respondents considered that new technologies will have a significant impact on the electronic communications sector with the following technologies having the largest impact in the upcoming years, listed hereinafter in order of attached importance: network virtualisation, artificial intelligence, open networks, followed very closely by edge cloud, and, at a distance, by low orbit satellite communications.

The majority of the respondents (including 50% of the companies and above 30% of the business associations that replied), considered that **network virtualisation** will have the greatest impact on the sector. Network virtualization is perceived to allow more flexibility, improve network efficiency, and constitute a major opportunity to develop new business models.

Artificial intelligence was considered the second most relevant technology by a significant share of respondents, notably by consumer organisations (57%), public authorities (40%), NGOs (39%), citizens (32%), research institutes (22%) and companies (15%). Respondents noted that it will enable the automation of network processes, ensure greater energy efficiency and help operators to identify network problems faster.

Open networks fluctuate between second and third place in terms of importance. Only large internet content providers listed it, on average, as the most impactful technology. Electronic communication networks ("ECN") providers and their business associations pointed out that this technology will have a major impact, enhancing innovation and offering a wide choice of retailers. Some companies, as well as NGOs, also considered that open networks have the ability to reduce the total cost of ownership in general.

Edge cloud is recurrently listed as the fourth most important technology, except for business associations, which place it in third place. Some respondents, in particular ECN providers and their business associations, consider that this technology will be relevant in the years to come for its ability to improve the user experience, its flexibility, and potential to improve the quality of the services.

There seems to be a consensus among a significant number of respondents that open networks, network virtualisation and edge cloud are technological breakthroughs that will

jointly have the largest impact in the coming years by driving cost reduction, improving resilience and security of the networks and boosting innovation and the development of new features and services.

Low orbit satellite communications technology disputed the fifth place with **terahertz communications**. The argument most often raised is that it will provide high speed internet in areas where the network is still unstable or not available.

According to a business association representing European mobile virtual operators, network virtualisation, edge cloud, or cloud RAN are already a market reality in many EU Member States but, in the future, they will be used more extensively and will allow operators to enjoy significant business synergies, cost savings and sustainability efficiencies. In particular, these technologies enable operators to run more and more core network, operational and business management functions in the cloud, including operations support systems and customer relationship functions.

ECN providers and business associations of ECN providers noted that technologies such as network as a service (NaaS) / network slicing and application programming interface (API) should equally be considered as technologies expected to significantly impact the electronic communications sector. They explained that technologies such as artificial intelligence or network slicing are at early stages of deployment and require substantial investments. A European business association representing ECN providers remarked that exploiting the full potential of the artificial intelligence technology require very high-capacity networks and 5G stand-alone networks.

All the above demonstrates the importance of the ongoing transformation of traditional electronic communications networks into cloud-based, virtualised, software-defined networks. This ongoing development is expected by the majority of the respondents to transform the ecosystem and represent a major opportunity of new business models.

ii. New technologies need new infrastructures

Overall, respondents stressed that those new technological developments require suitable, very high capacity and resilient connectivity infrastructures.

On the one hand, ECN providers highlighted that their current investment efforts are focusing on the deployment of 5G and the virtualization of their networks. In particular, networks will undergo a major transformation, transitioning from the traditional specialised hardware-based networks towards software-based, highly programmable, and cloud-native networks and disaggregated network architectures.

In their view, these developments are crucial to increase innovation and allow the EU to be more dynamic and competitive, promoting Europe's ability to become digitally autonomous/sovereign.

On the other hand, major digital platforms noted that they are channelling investments into technologies designed to refine bandwidth utilization and enhance end-user experience. Some digital platforms also emphasised the need to leverage the open internet to spur innovation and diversify content delivery. Other tech/platform companies highlighted that dedicated networks may not be essential for entertainment delivery in the future, while being fundamental in other sectors, such as healthcare or transport.

iii. New technologies have a positive environmental impact

The majority of the respondents also considered that overall the impact of the increased use of digital technologies on the environment will be positive. The uptake of more efficient and least consuming technologies, such as fibre networks, cloud, 5G or artificial intelligence, will play an important role in decreasing global CO2 emissions. Some respondents indicated that the use of renewable energy to power network equipment would significantly reduce the sector's carbon footprint. They also noted that the potential switch-off and decommissioning of legacy infrastructures (copper, 2G, 3G) and the move to cloud infrastructure (rather than on-premises data centres) would also contribute to decrease the carbon footprint.

iv. Data traffic

Looking at data traffic trends, about half of the stakeholders who provided a response on past increases, mainly ECN providers, identified Netflix as the primary contributor to network traffic (on fixed networks), while the other respondents were split in approximately equal numbers between those that attributed the heavy traffic loads generator to Facebook (on mobile networks) and those that pointed to Google. Additional notable contributors include TikTok, sports streaming services like DAZN, popular porn websites, and Hulu.

Nonetheless, academic/research institutes and NGOs responding to the consultation highlighted the difficulty in precisely identifying the sources of data and quantifying the share of traffic using content delivery networks (CDNs) due to the intricate relationships and dependencies within the digital ecosystem and the use of encryption.

Regarding the impact of compression algorithms on the volume of data transmitted through the operators' "network layers", the majority of the respondents (mainly ECN providers) reported that they have no significant impact, while business associations representing ECN providers indicated a slight decrease of up to 5% in data transmission due to compression algorithms.

In this regard, some respondents noted that the slower adoption of more efficient codecs indicates that overall traffic volume is unlikely to be fully compensated for in the future. ECN providers submitted that the continuous increase in data usage year-on-year outweighs significantly the benefits provided by the codecs. Some business associations (representing digital platforms), emphasised, however, the challenge of quantifying the potential impact of new compression algorithms on the volume of transmitted data over time.

Concerning the future outlook annual peak time traffic growth until 2030, based on the projections for annual peak-time traffic of the respondents (i.e. various ECN providers), on average, it is estimated that traffic will grow at an annual growth rate (CAGR) of 21% to 30% until 2030.

A total of 22 companies, mainly ECN providers, contributed with data to the questions related to the share of traffic sent or received through transit and peering. Based on the limited sample of data received no clear trend can be identified for the distribution of traffic between transit, paid and free peering.

b. Investments in Network Infrastructure

Around 25 respondents, primarily ECN providers, provided investment figures regarding past and future investments in network infrastructure in reply to the various questions of the exploratory consultation. The information reported below is aggregated to protect

confidential information and provides where possible general trends for the periods concerned.

i. Past investments before 2022

For the period 2017 to 2021, the respondents provided information on the direct investments in network infrastructure across the EU. A business association representing the ECN providers submitted that their members' total direct investments in network infrastructure amounted to EUR 258 billion over the period 2017-2021.

In relation to investments in the core network, half of the respondents to the question, mostly ECN providers, submitted that their direct investments in the core network have generally grown in recent years.

According to the same data, investments in the access network witnessed notable growth initially but declined in the last years.

At the same time, a business association representing ECN providers reported that the capital expenditure of those operators in upgrading mobile and fixed infrastructure has steadily grown (GACR 3.9%), although they claim that the revenues of the operators have remained flat.

At the same time, it is reported that, over the period 2017 to 2021, investments in mobile and fixed network infrastructure exceeded the investment plans by about 15% and close to 20%, respectively.

ii. Planned investments until 2030

The information submitted by the respondents is not sufficient to conclude on clear investment trends. Moreover, the information about planned investments provided by the respondents is focused on the Digital Decade 5G targets for 2030 and does not include the investments required for full 5G stand-alone and advanced capabilities such as, e.g. network slicing.

However, according to ECN providers, their main challenge is an increasing investment gap to meet the 5G coverage objective in Europe, highlighting the "poor returns" environment and the need for more network capacity. In this context, an association of ECN providers remarked in particular that meeting the Digital Decade 5G capacity requirements and universal 5G coverage, and thus unlocking the full socio-economic benefits of 5G, would require investments (in terms of CAPEX) two times higher than those made pre 5G. Referring to the EUR 174 billion investment gap estimated by the Commission until 2030, the same association submitted that additional investments of EUR 300 billion are needed to enable a comprehensive 5G vision for Europe but emphasised the challenging financial situation of operators to face those investments, with returns below the cost of capital, and the current macroeconomic uncertainties (e.g. higher interest rates, supply chain risks, etc.). Another European business association noted however that its associated operators have been able to attract private investors and that state aid grants funded by the Recovery and Resilience Facility would to a great extent help closing the gap between the private investments forecast and the total investment needed to reach the 2030 connectivity objectives.

c. Challenges: Investments and Incentives

As regards which key future market technologies will have a major impact on the electronic communication networks, their architecture or function, respondents pointed to the development of independent infrastructure management companies (40%), followed by the emergence of virtually integrated network management entities (23%), network slicing services (11%) and private local networks (6%). Many respondents noted other developments such as cloud and low-latency services as having a major impact on the networks. The move towards cloud-native and open networks will lead to increasing complexity, a need for integration and new network management capacities. This entails a revolutionary change on the networks which requires significant investments in infrastructure.

According to the respondents the most significant challenges for the electronic communication networks are related to the weak financial health of the telecoms sector and the lack of incentives for private investment, increase of cybersecurity and security breaches, and the balance between the technological advances and environmental concerns.

In this respect the majority of the respondents, in particular ECN providers, remarked that they are experiencing a decline in revenues and margins, while significant investments are needed in the sector. In addition, strengthening cybersecurity and network resilience is increasing costs. Half of the respondents, including ECN providers, digital platforms, and business associations, noted that the requirements related to increase spending on cybersecurity and network resilience will increase costs in the next 5 years due to investments in physical infrastructure, human skills, harmonised regulations and change of high-risk vendors.

Another significant challenge identified by the respondents concerned ensuring an adequate policy framework, with legal and economic barriers being cited across all categories of respondents as the main obstacles to the digital transformation.

In this context, in order to adjust to the technological and market changes and be able to compete globally and attract investments, respondents considered that ECN providers should first change their network architecture or functions; second, enter into cooperation or partnerships with other players across the internet value chain; and third, share their networks, enter into new segments, or delayering or reorganising the assets.

i. Legal Barriers

Large companies, including ECN providers and digital platforms, identified the legal and administrative barriers as important factors impeding growth. Many business associations from all categories of respondents as well as many research institutes considered that the current EU regulatory framework would need to be adapted to match the technological advances and ensure a competitive electronic communications sector. Different categories of respondents mentioned the need for a new regulatory policy approach to, inter alia, acquisitions of spectrum, merger transactions or legacy networks. One business association representing ECN providers mentioned that market fragmentation and regulatory burden causes operators to face significant economic restraints and remarked that, in 2021, the number of European operating groups with more than 500,000 customers were 38, as opposed to 7 in the US, 4 in Japan or 3 in China.

One EU level business association of ECN providers highlighted, however, that the EU regulatory framework has introduced competition dynamics that have enabled alternative

operators to invest intensively in very high-capacity networks and reach volumes larger than those made by former incumbents.

ii. Economic Barriers

For ECN providers, the investments in connectivity infrastructure are considered a priority, followed by cybersecurity and at some distance by network management and edge cloud. The majority of the respondents to the relevant question anticipated that investments amounting to up to 50% of their annual revenues within the next five years will be needed for the objectives of the digital transformation. Investments will revolve around skills, replacement of high-risks vendors and upgrades of physical infrastructures.

The large majority of the respondents, mostly ECN providers, estimated that on average each company would need to invest EUR 200 million each year. This estimate must however be put in perspective and depends most likely on the size of the responding companies as half of the respondents indicated a yearly investment of EUR 1 million, and a third of the respondents a yearly investment of more than EUR 90 million, while 9 respondents noted EUR 1000 million yearly investments.

d. Sources of Revenues and Funding Mechanisms

ECN providers claimed that their revenues in the sector, over the next 10 years, will depend on the provision of connectivity services, mainly internet access, moving away from the traditional voice telephony services. They added that their margins are low, and have high overall debt leverage, which limits their investment capabilities and affects their ability to attract private investors. A respondent active in vertical industries expressly noted that in the last decade, it has observed that the sectoral regulation had significantly impacted the financial health of the telecom operators and their ability to invest in networks and new services to generate new revenue streams to compensate for flat to declining average revenue per user. Thus, for ECN providers a key priority will be to adequately monetise the infrastructure rollout of next generation connectivity.

i. Business model: provision of connectivity services

ECN providers and their business associations pointed out that in the next 10 years their business model will focus on the provision of connectivity services, but that they would need to better monetise the infrastructure rollout of next generation connectivity.

Other companies noted that the success of this transformation will also depend on improving competitiveness, focus on the efficient delivery of services, and modernizing core network systems and operations (e.g. hybrid closed platforms to provide flexibility and scalability to support customer deployments at the edge of the cloud, bringing network loads to the cloud, etc.).

ii. Need for private investments

The majority of respondents (companies, business associations, NGOs and public authorities) considered that these investments will need to be made by private investors, namely private telecoms operators.

While for some of those respondents public funding is not adequate to finance the extra investments needed for the future connectivity, others including an association of telecom operators, pointed out that public funds from the Recovery and Resilience Facility, the

Connecting Europe Facility (CEF) and the European Funds for Digital Development could be or are expected to be used to finance infrastructure or to attract private investments. Therefore, some respondents argue that state aid may become increasingly important across Member States to close the investment gap on connectivity.

Many respondents, mainly EU citizens but also academic institutions, NGOs and trade unions, noted the risk that citizens would end up funding the additional investment needs of the sector through Internet access fees.

e. Contribution of Vertical Industries

As regards the expected contribution of vertical industries to investments in the new digital infrastructures (e.g. automated driving, manufacturing and logistics, health applications), the majority of the respondents stated that, albeit being critical for the sector's future development, vertical industries will not contribute significantly. In their view, vertical industries see themselves as pure customers or investors in private infrastructures solutions targeting their own specific needs.

A European business association representing ECN providers also noted that reserving spectrum for vertical industries would prevent in their view the efficient use of this scarce resource and put in jeopardy the success of public 5G services. Instead, they maintained that network slicing functionalities are key to create, *inter alia*, the applications that vertical industries demand.

Another sizeable group of respondents representing a variety of stakeholders, e.g. digital platforms, hyperscalers, content providers or vendors, noted, however, that vertical players are already investing in network infrastructure to enhance connectivity and improve their products and they expect them to continue to do so.

In the healthcare sector, for instance, there are examples of cooperation with telecom operators to develop open standards to enable an efficient use of the infrastructure. Others cited cooperation for 5G latency-critical applications in the automotive sector, which in their view has an overall positive effect on network investment.

In this sense, one stakeholder anticipates that the contributions of vertical industries will increase towards the end of this decade, reaching critical mass beyond 2030, but will depend on the adoption of services based on 5G/6G, Internet of Things, and Artificial Intelligence solutions and other technologies being developed and deployed by the vertical industries in cooperation with ECN providers. Another respondent noted that API ecosystem, multi-tenant and distributed network management approach will allow vertical industries to control an increasingly consistent part of the infrastructure, significantly rising commercial offer levers of action and customisation in a B2B2C perspective.

Promoting cross-sectoral cooperation is critical, for stakeholders, because connectivity, cloud and automation are key drivers for many vertical industries. In this respect, one stakeholder explained that to capture and benefit from increased productivity through digitisation, it will be essential that vertical industries invest in developing the ecosystem, including the necessary infrastructure. According to this stakeholder, this could generate revenue for operators and help develop ecosystems, but it will require a significant step change in the behaviour of both operators and vertical industries, who will need to work much more closely and often in partnership to ensure they are properly investing to meet the needs of the market.

2. Fairness for consumers

a. The Universal Service Obligation (USO)

Under the current regulatory framework for electronic communications, the rules on the Universal Service Obligation ("USO") aim at guaranteeing that the public sector provides a safety net, set at Union level, to ensure that at least the minimum electronic communications services (broadband internet access and voice communications) are available to all consumers at an affordable price.

i. Affordability

Regarding the expected evolution of prices, only a few respondents replied with concrete figures (21 respondents, mainly citizens and some ECN providers). The majority of these respondents replied that in their view the overall prices for broadband access will decrease in the coming years.

However, when looking to the views expressed in this respect broken down per broadband speed, the results are more nuanced. Concerning the price for access to broadband internet at speeds between 30 and 100 Mbps and 1 Gbps or above, the views of respondents were split, with substantially the same number of respondents considering that prices for these speeds are likely to increase or decrease.

ii. Accessibility

There is no consensus amongst respondents about the efficiency and effectiveness of USO to protect consumers with low income or special social needs. An equal number of respondents considered USO significantly or "not at all" useful to grant connectivity access to low-income consumers.

Amongst those considering USO as moderately efficient or having contributed little to protect consumers, they considered that it was the implementation of the EU telecommunications framework, competition in the markets, and the technological developments that have guaranteed affordable retail prices for consumers. In the same line, a number of respondents (e.g. NGOs, business associations, two academic bodies and a few operators) stated that the key to availability and affordability of Internet access in the Member States has been the competitiveness of the markets combined with sufficient network coverage, rather than the USO. Some other respondents remarked that the USO slowed down investments in connectivity infrastructure.

There are also no clear-cut views about the USO effectiveness to ensure equal access for persons with disabilities. The majority of the respondents (mostly citizens, and companies, in particular large ECN providers) did not answer the question or replied that they did not know (for instance, as noted by a consumer association) given the delays in some Member States in the transposition of the Electronic Communications Code[1] or its recent implementation.

Of the remaining respondents, a few considered that the tool has been moderately effective, and other few considered that it has been a little effective, because the USO is not the sole

[1] Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast), available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L1972.

tool used to achieve that goal and/or to help generalising access for persons with disabilities. There are, however, different degrees of efficiency and fairness across Member States.

iii. Impact of technological developments

Reflecting on the impact of the technological developments on the USO, the responses to the consultation were not conclusive. Replies ranged from some respondents submitting that the USO should be maintained in its current state despite technological and market changes (mainly citizens), to those others, at the opposite extreme, according to whom the USO will simply not be needed anymore (mainly ECN providers and their business associations). At the same time, some respondents (mainly citizens) think that the USO should evolve to meet the future connectivity demands, especially in rural areas.[2]

iv. Funding the USO in the next 10 years

Many respondents did not reply to this section of the questionnaire. Among those who replied, close to half of them indicated that the USO should continue to be funded by the public general budget, while the others considered that the USO should be funded by ECN providers. A minority of the respondents opted for widening the scope of funding providers and selected other ways of financing, including inter alia public subsidies or tax incentives.

Companies (mainly ECN providers and broadcasters), business associations and almost all the responding public authorities expressed their support for maintaining the current financing model. Consumer associations or content providers suggested a combination of public funding and contributions from the ECN providers. An association cautioned against making changes to the USO funding model to avoid introducing legal uncertainty for vulnerable consumers.

Those that suggested widening the scope of funding sources, indicated that a fair contribution from a larger pool of providers would ensure better services for consumers. They claimed that entities benefiting from access to the network should bear the costs of its development and that contributions could be calculated on the basis of and be proportional to identified criteria, e.g. size and revenue of the operator, the traffic generated, etc. A content provider noted that direct contributions to the USO from their sector would be detrimental for investments in content production.

v. Alternative solutions or EU-wide fund for consumers' affordable broadband access

As regards other means that could be put in place to support consumers' affordable access to broadband besides the universal service, respondents expressed diverse views. The majority of the respondents (ECN providers, Internet content providers, business associations and a consumer association) favour other funding means, such as social or connectivity vouchers

[2] Those who opt for the maintenance or the evolution of the USO regime, have heterogenous reasons and views. Some respondents (e.g. public bodies, trade unions) argue that the USO is the best tool to make connectivity services available to all segments of society at affordable prices although it has not delivered on its objectives so far. Other respondents (e.g. consumer associations or vendors) expressed the view that the USO regime should be periodically reviewed to adapt to the consumers' changing needs, including broadband speed and new devices. Finally, some participants indicated that the USO should not subsidise broadband network deployment.

for low-income households. Vouchers could be financed by national contributions and used for the provision of services by national operators.

Other measures such as forms of state aid (including tax incentives) were also mentioned as possible future tools. However, the respondents noted that the measures must be designed in a way that does not hinder the competitiveness of EU markets.

Others highlighted that such tools are not necessary because competition in the national markets and new technologies have led to high connectivity access and low connectivity prices for customers, and the appropriate legal instruments and incentives are already in place.

While half of the participants did not respond, the majority of respondents stressed that setting up an EU-wide dedicated fund for universal service purpose would not be useful, and that if it was created, it should be financed by, e.g., the public general budgets, contributions from ECN providers , contributions from online players or data generators, or other solutions, such as device manufacturers paying a small fee per device, utilizing social impact bonds, introducing taxes on networks, using other public funds, etc. Others considered that such a fund would be useful only for supporting network deployments in rural areas, and very few would be in favour of a fund supporting consumers' affordable broadband access only in specific crisis circumstances. In any event, all respondents agreed that, if created, such fund should only complement national or private funding on network deployment.

b. Intra-EU Communications

As regards measures in intra-EU communications, half of the respondents, mainly citizens, public authorities and consumer organisations, considered that the current retail price caps should be maintained and thus extended. A majority of those also submitted that the retail price caps should be adjusted. Among those, a public body noted that the retail prices should be subject to periodical review to ensure they continue to make those communications affordable for consumers. For the others, current retail price caps should be maintained because the measures have been in force only since May 2019. Therefore, their implementation is too recent to provide sufficient perspective to evaluate whether they have been effective to fulfil their objective of protecting consumers from excessive high prices when making intra-EU communications.

The other respondents, mostly ECN providers and their business associations and academic institutions, retail price regulation would not be needed in the future. A number of these respondents argued that there is no need for regulation because the prices for mobile intra-EU calls have consistently decreased and are currently well below the regulatory caps. Other respondents (mainly business associations) pointed out that price regulation may hinder innovation and investments, for example, in fibre or 5G, and a national consumer association considered that other areas of consumer welfare deserve more attention.

3. Barriers to the Single Market

a. Future developments and the development of the digital single market

Stakeholders were asked to assess the development and promotion of the European digital single market in relation to the new technological and market developments and the barriers to the provision of cross-border services.

i. Technological developments, new applications, network architecture or functions

The question related to impact of technological developments, new applications and network architecture or functions on the single market, was answered mostly by ECN providers and vendors, relevant business associations and public authorities.

Among the developments that could promote the digital single market, respondents mentioned, mainly, the following:

- Cooperation on key technology developments (e.g. Edge Cloud, Network APIs, Open RAN) to enable service providers to scale operations across a larger number of customers.
- Simplification of the core network through cloud native architecture to be able to share it across different national markets and leveraging on pan European core network to simplify sharing IT among different national affiliates.
- Standardisation of technologies and building of cross-country platforms to meet customer demand across the single market.
- Initiatives focused on common building blocks like federation models, interoperability, industry standardisation and open source.
- Regulation to ensure better harmonisation of spectrum management.
- Improvement of security solutions.
- Introducing flexibility and simplify regulation.
- Provision of funding beyond the early R&D stages.
- Promoting open standards and open architectures.

ii. Obstacles to the Digital Single Market

The large majority of the respondents to this question concentrating on obstacles to the Digital Single Market were of the view that full integration of the single market for electronic communications is hampered by the fragmentation of the sector into national markets. This is due both to cultural and diverging market circumstances and the lack of full harmonisation of sector rules (e.g. building lawful interception capabilities, data retention, data protection, reshoring requirements, cybersecurity and reporting obligations and network/service incident reporting requirements, spectrum auction conditions, etc.), which is also caused by a slow and piecemeal implementation of EU rules at national level and fragmented approaches to enforcement.

The responding public bodies submitted that achieving a unified regulatory approach that promotes fair competition and innovation remains a challenge.

Moreover, respondents (mainly telecom companies and NGOs) provided their views on what regulatory changes would be required as a result to ensure the competitiveness of the European electronic communications market. For the majority of the respondents, in particular large ECN providers, policymakers must make changes to the regulatory paradigm to ensure that investments can be made in an efficient way and facilitate cooperation between players. Finally, those respondents also remarked the need of furthering the coordination of radio spectrum policies in the EU setting harmonised conditions.

Other respondents, namely, broadcasters, digital platforms and media pointed out that the single market would benefit from a much simpler harmonised regulatory regime, which included the necessary consumer protection measures. For those respondents, the lack of return on investment for the private sector is the main barrier to deploying fibre in the Member States. Removing barriers to investments and considering a more flexible regulatory framework would facilitate the provisions of communication services across the Union.

For the responding NGOs, it would be key to set up clear regulations for data handling and consumer protection.

iii. Cost Savings and Efficiencies

A few ECN providers, broadcasters and citizens addressed the question of the expected cost savings or other efficiencies that could arise from the EU-wide deployment of infrastructure and/or provision of services by ECN providers.

Overall respondents agreed that streamlining and simplifying regulation and harmonising best practices at EU level could also reduce administrative burdens, supply chain or regulatory costs and increase the efficiency and speed of infrastructure deployment.

One ECN provider highlighted that efficiencies are possible on the condition that telecom operators are able to share common "core network architectures" (and associated IT) among affiliates and across different Member States.

Among the examples provided, one respondent estimated that a full centralisation of the new 5G core network across the EU, where all network functions would be located in central data centres, could deliver benefits in the range of EUR 200-300 million over the next five years. It was also submitted that global service platforms could deliver cost savings of up to EUR 100 million providing network slicing services to business customers.

iv. Cross-border consolidation of electronic communications providers in the EU

The majority of the respondents to the question, mostly ECN providers and digital platforms, agreed that burdensome sectoral regulation on notably ECN providers is a major obstacle to cross-border consolidation. They also identified additional obstacles such as, *inter alia*, different legal standards, fragmented investment protection mechanisms and lack of interoperable networks due to radio spectrum usage variations and/or ECNs using different standards, and legal requirements that vary across EU Member States that prevent operations. In their view, it would be important to rely on a harmonised regulatory framework and common interpretation of horizontal legislation. A small number of respondents, namely certain national authorities and business associations submitted that there are no major obstacles to cross-border consolidation or to technical and commercial integration.

In more detail, some ECN providers indicated that there are no obstacles to cross-border consolidation other than the lack of a business case due to the insufficient efficiencies that

cross-border consolidation could achieve. Furthermore, responding ECN providers and their business associations noted that cross-border consolidation of operators does not bring the same synergies as intra-market consolidation. At the same time, they highlighted that cross-border consolidation requires scale, which European operators do not have to a sufficient extent. ECN providers proposed consolidation of operators at intra-market level as a first step instead and urged a review of the European merger control policy. Once the financial and economic situation of the European ENC providers improve at national market level, they consider cross-border consolidation possible.

The digital platforms noted that, in their view, cross-border consolidation requires further harmonisation of the EU regulatory framework, of the spectrum policies, changes to the merger control policies and specific national requirements to facilitate cross border mergers between electronic communications operators.

b. Radio Spectrum Policy

The majority of the respondents, mostly companies (ECN providers and digital platforms), business associations and consumer organizations, welcomed the idea of a more integrated spectrum market and a harmonised approach to spectrum management across the EU.

For the respondents, a more integrated spectrum market in the EU would facilitate the deployment of cross-border services. In particular, in their view, it would (i) facilitate spectrum coordination, (ii) enhance efficiency in the use of spectrum by lowering restrictions at border sites, and (iii) improve coverage in the border zones and minimise handover issues.

In addition, harmonising the approach to spectrum management would promote better investment conditions and unleash the potential of a larger single market. It can also lower device and equipment costs through economies of scale, accelerating further development of M2M, IoT and autonomous driving.

Looking at the replies by categories of respondents, ECN providers underlined that better aligned spectrum auction models and licence conditions would be beneficial and supportive of investments. Some digital platforms and NGOs appeared less clear about the benefits arising out of a fully integrated radio spectrum market, whereas national authorities considered that the existing spectrum management framework functions well, and the broadcasting industry considered that more integration is not appropriate.

Some respondents also expressed preference for flexibility to accommodate national circumstances / specificities.

i. A common EU-level licensing/authorisation scheme for spectrum use: added value, risks and costs of implementation

The majority of the respondents, mostly ECN providers and their business associations, were in favour of a common EU-level licensing/authorisation scheme in certain cases of cross-border nature (e.g. for satellite communications), where it could offer several potential benefits such as economies of scale, reduced administrative burden, lower costs.

However, some also pointed out, *inter alia*, the complexity of a common EU-level licensing/authorisation, and the high risks and efforts involved due to the differing national circumstances and policies. In particular, some ECN providers highlighted that the introduction of a common EU-level licensing/authorisation would require a huge effort to overcome national licensing policies in terms of harmonising the duration of licences and

usage conditions. In addition, some ECN providers and their business associations argued that, beyond certain use cases, it may entail risks of distorting competition in favour of large-scale operators.

Respondents from the broadcasting sector argued that a common EU-level licensing/authorisation scheme would be inappropriate, notably due to regional and national demands for services which cannot be addressed at the EU level.

At the same time, mostly citizens, a few national authorities, NGOs and academics, considered that the risks and costs of a common EU-level licensing/authorisation scheme are likely to outweigh the benefits. Some national authorities commented that such a common EU-level licensing/authorisation scheme would not be optimal to address national market circumstances (e.g. population density, purchasing power of end-users and coverage requirements).

Finally, some ECN providers and their business associations suggested that it would be more appropriate to align the approaches to licensing, e.g. regarding licence duration, reserve prices, annual costs.

ii. Participation of non-EU countries in the technical preparatory work for EU decision making process

Some respondents expressed concerns about the participation of non-EU countries/entities in the technical preparatory work for EU decisions on spectrum harmonisation. For instance, consumer organisations and citizens considered it as a potential issue of concern for EU sovereignty, as non-EU countries could have their own industrial interests and differing political orientations. Many national authorities, ECN providers and their business associations, however, did not generally see it as a concern.

In addition, most national authorities, ECN providers and their business associations highlighted the importance of keeping an inclusive approach in the European Conference of Postal and Telecommunications Administrations ("CEPT") to discuss and agree on spectrum harmonisation and positions ahead of international negotiations. Furthermore, some respondents emphasised that it was important to ensure that in international fora such as CEPT and International Telecommunication Union (ITU) Member States act with a common voice that duly reflects the EU's geopolitical interests.

iii. Addressing harmful interference from third countries: added value, risks and costs of EU exclusive implementation

Overall, the large majority of respondents, representing mainly ECN providers, their business associations, digital platforms and EU citizens, agreed on addressing interference from third countries at the EU-level, upon a request of the Member State(s) concerned, as the Member States would benefit from the political weight of the EU as a region, and this would maximise success.

National authorities presented more cautious views, highlighting that interference cases are best dealt by the countries concerned since this often requires knowledge of the local situation, national circumstances and specific technical expertise, but also acknowledging that a coordinated approach at EU level (especially through enhancement of the role of the Radio Spectrum Policy Group's good offices sub-group) could be beneficial.

4. Fair Contribution by all Digital Players

a. Fees paid to ECN providers within the EU

In relation to contributions currently paid to ECN providers, the information provided by the few respondents, mainly ECN providers, indicate different business practices across Member States. Whilst in Germany and Belgium an increase in fees paid for transit and interconnection over the past five years has been observed, conversely, in Austria, France, Italy, Latvia, Norway and Spain operators pointed out that they have experienced varying degrees of reductions in the fees paid during the period from 2017 to 2022.

Several ECN providers anticipated a negative outlook over the next five years driven by the continuous decline in unit prices (in terms of EUR/Mbps), which would counteract the revenue potential arising from the increased data traffic, and the investments needed to support the traffic increase that would exceed the proportional revenue growth.

For over-the-top (OTT) streaming service providers, the voluntary peering agreements and localised content delivery offer mutual benefits for content application providers, internet service providers, and their respective customer bases, promoting efficient traffic exchange and cost savings.

b. Identifying Large Traffic Generators and impact on network deployment

On the identification of large traffic generators (LTGs) that have an impact on their networks, several ECN providers proposed to identify them as those companies that account for more than 5% of an operator's yearly average busy-hour traffic (measured at company/national level). In contrast, content providers argued that any fee policy initiative based on 'traffic share' would be fundamentally flawed and should not be a viable option. For various tech/media business associations, introducing a notion of LTG, and making those within the scope pay fees, is not a future-proof approach. Certain research institutes submitted that content providers made investments in network infrastructure that directly reduce costs for internet service providers, and in their view, investment in compression algorithms could further generate substantial cost savings.

Regarding the impact on the cost of network deployment of LTG's investments in digital infrastructure and other innovations over the last 5 years, the majority of the respondents to the question (largely ECN providers, and a few business associations and NGOs) reported increased costs. Among the other respondents, there was a relevant number that reported a cost increase of 20% or more of network deployment investments related to the increase of data traffic. Very few respondents declared that they had observed a decrease in costs.

All responding ECN providers also expected an increase of the network investment incremental costs resulting from increase data traffic in the next decade, especially regarding mobile networks. However, only one ECN provider submitted precise figures. Overall, they emphasized the need for continuous investments in network infrastructure to manage the increases of data traffic.

c. Fair Contribution Mechanism: raison d'être

The majority of respondents to the relevant question (ECNs, digital platforms and their business associations, as well as citizens) indicated that currently there are obstacles for ECN providers to charge digital players for increased data traffic. Consumer organisations,

academic institutions, and the majority of NGOs also saw obstacles. The reasons however diverge.

For ECN providers, the main obstacles would result from an imbalanced bargaining power between them and LTGs. They added that LTGs can reroute their traffic through any route independently of its capacity and influence the consumers' choice of Internet service provider via indexes assessing the quality of service of the Internet service providers. ECN providers submitted that regulatory intervention is necessary to ensure payments from LTGs.

NGOs, consumer organisations, and academic institutions expressed concerns over the risk of breach of the principle of net neutrality. One European consumers association is of the view that price regulation with regards to the interconnection market would not be compatible with the existing net neutrality rules. Citizens expressed concerns about introducing disincentives for digital services.

Content providers and broadcasters disagreed with the position of the ECN providers, indicating that some large ECN providers are already able to charge content providers for peering and noting that the vast majority of interconnection agreements are settlement-free (either via peering or exchange with public internet exchange points). They referred to economic, technical and net neutrality concerns should payments be imposed. Content providers warned about unintended consequences in the content markets and on the overall growth of the internet ecosystem should such a mechanism exist.

ECN providers submitted that the payment mechanism would have a positive impact on the environment as they could invest in more efficient technologies, in particular in more efficient data traffic handling technologies. Business associations representing ECN providers noted that a yearly contribution by LTGs of EUR 20 billion to network costs could reduce the energy consumption of European telecom operators by 28%, and their CO2 emissions by 94%.

Content providers showed scepticism regarding the effectiveness of network fees in optimising the environmental impact of networks. Some cited research by associations of telecom operators that disassociates the increase in data traffic from energy efficiency, while others remarked that the overall carbon footprint of ECN providers is relatively low. Others pointed out to the technological solutions they have already invested on to reduce and optimise energy consumption, such as cloud technologies. An association of content providers suggested that a payment mechanism may increase prices and shift consumers to physical media, increasing the environmental impact.

Some citizens saw potential benefits of a payment mechanism for reducing transit and environmental impact, while others worried about the impact on citizen-run services. Other civil societies raised concerns about offshoring and longer data value chains.

d. Fair Contribution Mechanism: structure, contributors and beneficiaries

More than half of the overall respondents replied to the question of whether they supported that digital players benefitting from the digital transformation should contribute in a fair and a proportionate manner to the costs of public goods, services and infrastructures, and about the introduction of a mandatory mechanism of direct payments from content application providers (CAPs)/LTGs to contribute to finance network deployment.

While the majority (mostly digital platforms, CDNs, consumer organisations and citizens) of the respondents expressed opposition to a mandatory mechanism of direct payments from CAPs/LTGs to contribute to the financing of network deployment, other respondents

(primarily ECN providers) supported the system as a tool to address the imbalanced bargaining power between them and LTGs.

According to those ECN providers in favour of a mandatory mechanism of direct payments, LTGs generate revenue without contributing to network costs, while ECN providers struggle to recover investments. For them, the mechanism could reduce the investment gap, incentivise traffic generation, and benefit consumers. Implementing the mechanism would require introducing the obligation to negotiate, a dispute resolution mechanism, and price monitoring.

For the large majority of the respondents to the question, if the mechanism was introduced, LTGs should be the main contributors. Some suggested to introduce thresholds to include, for instance, only those with, e.g. a minimum of 100 million users; annual revenues exceeding EUR 10 billion; those responsible for 5% or more of total network capacity, 5% of peak hour bandwidth, or 10% of peak time traffic.

For the majority of those who supported the introduction of the payment mechanism (mostly ECN providers) ECN providers should benefit from the direct payments to the extent that they invest in network infrastructure in Europe. Among the remaining respondents, many suggested that all Internet access service providers should receive support, covering both network expansion costs and expenses in challenging areas. Only a minority of the respondents suggested supporting regulatory authorities, network operators, and consumers rather than directly funding private companies.

For ECN providers, the benefits of such contribution would be numerous. They listed benefits such as e.g. reduced investment gaps, increased economic attractiveness, faster rollout of advanced networks, better internet quality for European citizens, sustainability, innovation, job creation, consistent and competitive prices for EU consumers, improved business case for access networks and investors, enhanced network coverage and reliability for Big Tech companies, improvement of the digital single market, improved coverage in remote regions, limited regulatory costs and administrative burdens, and a direct contribution mechanism with fair price signals.

Most respondents, mostly ECN providers, proposed the following possible structure for the mechanism: (1) good faith negotiation between LTGs and ECN providers on the fee to be paid based on data traffic and reflecting investments; (2) introduction of dispute resolution mechanism if no agreement is reached, and (3) arbitration.

In addition, other ECN providers and semiconductors companies expressed a preference for a market-led framework based on bilateral negotiations on fair and reasonable terms.

However, some respondents (across different stakeholder groups, including digital platforms, content providers, and consumer organisations) expressed their concern about the introduction of direct payments. In addition to the risk of undermining the principle of net neutrality, as laid out in the Open Internet Regulation, the following risks were most cited by those respondents (e.g. digital platforms, content providers and consumer organisations):

- Disincentives for innovation: respondents expressed concern that direct payments could potentially reduce the incentives for innovation, particularly for small traffic generators. They argued that successful innovations that demand high data transfer could be subject to substantial payments, leading to an unwanted reduction in demand for data transfer services.
- Negative consequences for consumers: digital platforms, content providers and consumer organisations agreed that direct payments could lead to negative

consequences for consumers, in the form of a reduction in the variety of content available and/or higher prices for internet access.

- Negative consequences on competition: respondents highlighted the potential for direct payments to negatively impact competition between large and small ECN providers, as larger undertakings transfer more data and would receive more payments.

When asked about what mitigating measures could be put in place to avoid the risks mentioned above, respondents suggested measures such as excluding small and medium traffic generators from direct payments or introducing transparency about the funds each network operator receives and how these funds are used to improve network infrastructure.

e. Introducing an EU/national digital contribution or fund

The large majority of the respondents, including large ECN operators and their associations, digital platforms, pure-play content providers, consumers organisations, and public authorities, expressed their opposition to the idea of an EU/national digital contribution or fund, citing concerns about market distortion, potential infringement of EU State aid law, and a preference for fair taxation harmonised across the EU instead.

Among the lower number of respondents who supported the idea of EU/national digital contribution or fund, some (business associations for the broadband and fibre sectors) submitted that it would avoid the distortion of competition resulting from direct payments and negotiations between ECN providers and LTGs. The fund should in their view finance the deployment of high-capacity networks and network deployment across Europe, as well as the higher costs related to increased traffic. Those respondents noted however that it would be for the beneficiaries of the digital transformation (including LTGs and other major digital players) to finance the fund.

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