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Exploratory Consultation

The future of the electronic communications sector and its infrastructure

Fields marked with * are mandatory.

1. Introduction

At a time when digital technologies play an increasingly prominent role in social, economic, and political life worldwide, Europe's digitalisation is essential for its prosperity, as long as it is human-centric and respects our common EU values and the rights, dignity and integrity of the individual.

Digital technologies can be used to deliver services to people and make the EU's economy greener, more resilient and more inclusive, leaving no one behind. Booming technologies like connected objects, upcoming innovations in Artificial Intelligence ("AI"), or high-performance computing mean that the digital transformation will play an even bigger role in the everyday lives of Europeans; and a bigger role in securing its competitiveness. This is why the EU needs performant, sustainable digital infrastructure, starting with reliable network connections.

A sustainable digital infrastructure for connectivity is critical to take advantage of the benefits of digitalisation, for further technological developments and for the Union's digital leadership and autonomy. Reliable, fast and secure connectivity is a must for everybody and everywhere in the Union, including in rural and remote areas. The "Digital Decade" vision launched by the European Commission in 2021[1] and enshrined in the Digital Decade Policy Programme[2] in December 2022, further highlights the importance of the connectivity infrastructure, and accordingly sets political targets for 2030.[3] Concretely, by 2030, networks with gigabit speeds should become available to those who need or wish to have such capacity.

Digital markets and, in particular connectivity markets, are also facing transformative technological and market developments in the form of e.g. cloudification of networks, transition to edge computing, requirements for operation in the metaverse, for AI, etc.

Moreover, they are not isolated from the challenging geopolitical and economic situation overall.

New generations of mobile communications will require massive investments in fibre and densification of antennas. New performance will enable critical use cases and the connection of objects. These developments will likely have a significant impact on the business model of providers of electronic communications networks (“ECNs”), as well as of other actors in the value chain. In light of this, it is important to broadly reflect on how to secure a resilient connectivity architecture based on a sustainable business model able to support our digital future in the EU.

Now is therefore a key moment to have a comprehensive look at the connectivity sector and investigate where it stands, and what would be the needs for the future. The European Commission therefore launches the present exploratory consultation on the vision for the future of the connectivity sector and of the connectivity infrastructure.

Pursuant to Better Regulation rules, an exploratory consultation is preliminary in nature, and targets those that may provide insights to determine if any problem exists and could be addressed by EU action, or sketch the potential scope of a genuinely new policy.

The consultation is available in English, French and German, and it is open for responses through the EUSurvey tool for 12 weeks.

The questionnaire of the present consultation is structured along four sections and each of the sections includes a short introductory explanation of its background and rationale:

- Technological and market developments: impacts on future networks and business models for electronic communications
- Fairness for consumers
- Barriers to the Single Market
- Fair contribution by all digital players

Questions can be left blank. However, in order to be able to see different perspectives **we welcome replies from all types and categories of respondents**, also on questions that might prima facie not fall in their remit or knowledge.

Please make sure to save a draft of the questionnaire regularly as you fill it in, and to submit the questionnaire ("submit" button at the very end) before the end of the consultation period.

You can download the questionnaire in PDF format before starting to help you with the

preparations or discussions within your organisation. You will be able to download an electronic copy of your replies.

If you have any questions or problems regarding this exploratory consultation, please contact CNECT-FUTURE_OF_CONNECTIVITY@ec.europa.eu.

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[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, "2030 Digital Compass: the European way for the Digital Decade", COM(2021) 118 final, 9.3.2021.

[2] Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030 ("Digital Decade Policy Programme 2030"), OJ L 323, 19.12.2022, p. 4.

[3] See Art. 4 Digital Decade Policy Programme 2030.

2. Background

2.1 Technology and market situation and challenges

As the importance of connectivity increases, massive investments in network infrastructure are needed in order to accommodate and integrate new technologies while at the same time attending to growing redundancy and cybersecurity requirements. Deployments in 5G and 6G (i.e. TeraBit capacities and sub-millisecond latency, answering to future network requirements) and new generations of mobile communications will require massive investments in fibre and densification of antennas. An increase in traffic volume, with low latency requirement is reported and this trend is likely to continue in the future. In Europe, but also elsewhere, one can witness a very fast evolving market where new revolutionary digital developments are to be expected (e.g. metaverse, Web 3.0). Network virtualisation, software defined networks ("SDNs"), private networks, network slicing and network sharing become increasingly common and one can observe the convergence between connectivity, computing (high performance computing (HPC)), edge computing, AI and storage (edge clouds).

Moreover, there is a tendency to separate different market elements (delayering), e.g. fibre and wholesale-only operators, and tower companies; while hyperscalers are investing in their own cable infrastructure. As regards data traffic, one can observe developments such as compression techniques, which allow a more efficient data transmission, as well as the practice of certain content providers to bring their content closer to the end-user by way of own infrastructure or the use of Content Delivery Networks ("CDNs").

Internet value chain has become increasingly complex, e.g. where mobile network operators are starting to deploy edge cloud infrastructure and to partner with hyperscalers. Cloud providers are beginning to offer last-mile networks to industrial clients using private 5G mobile

networks. CDNs are increasingly integrated into cloud based “infrastructure/platform as a service”. Mobile network operators are no longer the only players partnering with vertical industries to set up 5G local networks: vendors and cloud operators are equally ready and well equipped to play a role in these new markets. One can witness the emergence of vertically integrated global companies (such as Google, Amazon or Apple who also deploy their own submarine cables or backhaul).

The market of connected devices and applications is evolving very fast, with new technological developments, such as augmented and immersive reality, blockchain, digital twins, and AI. In the longer term, interoperable internet applications are expected to create consistent perceptions: this vision (sometimes referred to as “metaverse”) represents a future transformative frontier of the digital environment. Also developments such as “softwarisation” and virtualisation of networks; cloud functionalities and AI, edge computing will lead to architectural changes in connectivity infrastructure.

2.2 Demand situation

Increasingly competitive and deregulated markets have over the last decades resulted in competitive and affordable prices and choices for European consumers. Broadband coverage of rural areas remains challenging (8.5% of households not covered by any fixed network). 4G is widely available also in rural areas while 5G coverage accounts for only 34.7% of populated rural areas.[4] End-users as well as businesses are however increasingly dependent on internet access (fixed and mobile) and on the services and content available through this access. This has also resulted in an observed increased demand for faster broadband connections. The changes arising from the current market and technological developments would likely affect all European consumers and end-users, including SMEs. Rising inflation and the significant increase in the cost of energy will likely result in higher costs for internet service and content providers, despite the shift to the more energy efficient technologies of fibre and 5G.

2.3 Investment situation

Massive investments in network infrastructure are still needed to achieve Europe’s Digital Decade goals. The latest estimates quantify the investment needs until 2030 at around EUR 174 billion.[5] Some European providers of electronic communication networks and services, especially incumbents, claim that they suffer from a decreasing market valuation and lower return on investment, especially when compared to companies in the US (including both over-the-top players (“OTTs”) and infrastructure operators). They also claim that their alleged declining margins and increasing costs would put their future network investments at risk as, due to the current uncertainties (high inflation, hikes in interest rates and geopolitical tensions), capital markets appear to be more prone to focus on assets with short-term returns

/profitability and to prefer solutions that protect them from demand risk.

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[4] Digital Economy and Society Index (DESI) – September 2022.

[5] This figure includes the coverage by 5G of major transport paths and does not take into account potential cost reduction thanks to the simultaneous deployment of fixed and mobile Gigabit networks. Source: “Investment and funding needs for the Digital Decade targets“ study, upcoming.

3. About you

* **Language of my contribution**

- (•) English
- ( ) French
- ( ) German

* **I am giving my contribution as**

- ( ) Academic/research institution
- ( ) Business association
- ( ) Company/business
- ( ) Consumer organisation
- ( ) EU citizen
- ( ) Non-EU citizen
- ( ) Non-governmental organisation (NGO)
- (•) Public authority
- ( ) Trade union
- ( ) Other

* **First name**

* **Surname**

* **Email** (this won't be published)

* **Scope**

- ○ International
- ◉ European
- ○ National
- ○ Regional
- ○ Local

* **Organisation name**

255 character(s) maximum

Netherlands Ministry of Economic Affairs and Climate

* **Organisation size**

- ○ Micro (1 to 9 employees)
- ○ Small (10 to 49 employees)
- ○ Medium (50 to 249 employees)
- ◉ Large (250 or more)

* **Country of origin**

Please add your country of origin, or that of your organisation.

This list does not represent the official position of the European institutions with regard to the legal status or policy of the entities mentioned. It is a harmonisation of often divergent lists and practices.

- ○ AF - Afghanistan
- ○ AL - Albania
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- ○ AR - Argentina
- ○ AM - Armenia
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- ○ AT - Austria
- ○ AZ - Azerbaijan
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- BD - Bangladesh
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- DE - Germany
- GH - Ghana
- GR - Greece
- GD - Grenada
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- GY - Guyana
- HT - Haiti
- HN - Honduras
- HU - Hungary
- IS - Iceland
- IN - India
- ID - Indonesia
- IR - Iran
- IQ - Iraq
- IE - Ireland

- IL - Israel
- IT - Italy
- JM - Jamaica
- JP - Japan
- JO - Jordan
- KZ - Kazakhstan
- KE - Kenya
- KI - Kiribati
- KW - Kuwait
- KG - Kyrgyzstan
- LA - Laos
- LV - Latvia
- LB - Lebanon
- LS - Lesotho
- LR - Liberia
- LY - Libya
- LI - Liechtenstein
- LT - Lithuania
- LU - Luxembourg
- MG - Madagascar
- MW - Malawi
- MY - Malaysia
- MV - Maldives
- ML - Mali
- MT - Malta
- MH - Marshall Islands
- MR - Mauritania
- MU - Mauritius
- MX - Mexico
- FM - Micronesia
- MC - Monaco
- MN - Mongolia
- ME - Montenegro
- MA - Morocco

- MZ - Mozambique
- MM - Myanmar
- NA - Namibia
- NR - Nauru
- NP - Nepal
- NL - Netherlands
- NZ - New Zealand
- NI - Nicaragua
- NE - Niger
- NG - Nigeria
- KP - North Korea
- MK - North Macedonia
- NO - Norway
- OM - Oman
- PK - Pakistan
- PW - Palau
- PA - Panama
- PG - Papua New Guinea
- PY - Paraguay
- PE - Peru
- PH - Philippines
- PL - Poland
- PT - Portugal
- QA - Qatar
- MD - Republic of Moldova
- RO - Romania
- RU - Russian Federation
- RW - Rwanda
- KN - Saint Kitts and Nevis
- LC - Saint Lucia
- VC - Saint Vincent and the Grenadines
- WS - Samoa
- SM - San Marino
- ST - Sao Tome and Principe

- SA - Saudi Arabia
- SN - Senegal
- RS - Serbia
- SC - Seychelles
- SL - Sierra Leone
- SG - Singapore
- SK - Slovakia
- SI - Slovenia
- SB - Solomon Islands
- SO - Somalia
- ZA - South Africa
- KR - South Korea
- SS - South Sudan
- ES - Spain
- LK - Sri Lanka
- SD - Sudan
- SR - Suriname
- SE - Sweden
- CH - Switzerland
- SY - Syrian Arab Republic
- TJ - Tajikistan
- TZ - Tanzania
- TH - Thailand
- TL - Timor-Leste
- TG - Togo
- TO - Tonga
- TT - Trinidad and Tobago
- TN - Tunisia
- TR - Turkey
- TM - Turkmenistan
- TV - Tuvalu
- UG - Uganda
- UA - Ukraine
- AE - United Arab Emirates

- GB - United Kingdom
- US - United States of America
- UY - Uruguay
- UZ - Uzbekistan
- VU - Vanuatu
- VE - Venezuela
- VN - Viet Nam
- YE - Yemen
- ZM - Zambia
- ZW - Zimbabwe

The Commission will publish all contributions to this exploratory consultation. Your contribution will be published as submitted. If you consider that your replies to certain questions of the questionnaire are confidential, please mark those questions as confidential in the last "Confidentiality" section of the survey. Responses to questions marked as confidential will not be published.

If you include confidential information in any position paper or document uploaded to the questionnaire, please provide both a confidential and a non-confidential version. Information marked as confidential will not be published.

Access to such information is provided to the Commission staff on a ‘need to know’ basis. External contractors engaged by the Commission services may also have access to confidential data to the extent needed, and will be bound to confidentiality obligations pursuant to specific contractual obligations. Confidential data may also be shared with BEREC or the BEREC Office for the purposes of fulfilling their tasks provided the protection of confidentiality is ensured.

You can choose whether you or your organisation agrees to have your details published (on the Internet or in any other support) or to remain anonymous when your contribution is published.

If anonymity is requested, the requestor shall make sure that he/she is not identifiable either from any comments made in the reply or from any file attachment. Anonymity will also be ensured should the Commission engage an external contractor to process the information gathered during the consultation.

Please note that, for the purpose of transparency, the type of respondent (e.g., ‘business association, ‘consumer association’, ‘EU citizen’) and country of origin, will always be published.

Opt in to select the privacy option that best suits you. Privacy options default based on the type of respondent selected. More information on the processing of personal data is available here.

* **Contribution publication privacy settings**

- **Public**
  Organisation details and respondent details are published: The type of respondent that you responded to this consultation as, the name of the organisation on whose behalf you reply as well as its size, its country of origin and your contribution will be published. Your name will also be published.
- **Anonymous**
  Only organisation details are published: The type of respondent that you responded to this consultation as, the name of the organisation on whose behalf you reply as well as its size, its country of origin and your contribution will be published as received. Your name will not be published. Please do not include any personal data in the contribution itself if you want to remain anonymous.

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Section 1. Technological and market developments: impacts on future networks and business models for electronic communications

New generations of mobile communications will require massive investments in fibre and densification of antennas. New performance will enable critical use cases and the connection of objects. The growing requirement for strategic autonomy, security and sovereignty regarding key enabling technologies in the electronic communications area will also have a significant impact on future developments. In particular, the EU's 5G security toolbox[6] puts forward measures including restrictions on high-risk suppliers, some of which are likely to be present in existing networks and may require replacement over time.

Moreover, it is to be recalled that environmentally, information and communications technologies are an important enabler of emission reductions for many sectors in the economy, while at the same time they themselves need to make an effort to reduce their environmental footprint.

It is expected that technology will evolve towards the disaggregation of software and hardware. This is likely to offer possibilities to reconfigure most electronic communications assets, hence leading to an optimisation of the value chain. In turn, hardware facilities will be

subject to increasing network shared use between market actors, not only among electronic communications operators but also involving industry sectors. In particular, network slicing will enable new market actors in the sector to operate virtual networks almost as they would operate a proprietary physical network. Overall this could lead to the future network architecture becoming more a platform type of architecture.

European critical entities are more interconnected and interdependent, which makes them stronger and more efficient but also more vulnerable in case of an incident. In this context, the Commission recently proposed a Council Recommendation on a coordinated approach by the Union to strengthen the resilience of critical infrastructure. Furthermore, to respond to the increased exposure to cyber threats due to the increasing degree of digitalisation and interconnectedness of our society and the rising number of cyber malicious activities at global level, the Commission proposed in 2020, a directive introducing updated rules on cybersecurity of network and information systems. The NIS 2 Directive[7] entered into force in January 2023. The increased cyber threat may nevertheless trigger additional needs and increased costs for strengthening the cybersecurity, and the resilience and redundancy of networks.

Network virtualisation and cloudification is expected to have a similar impact on the business model of providers of ECNs as cloud computing has produced on the IT sector, i.e. transforming a large proportion of incremental investment costs into linear operational expenses (shifting CAPEX to OPEX). In this new context, other (specialised) players are likely to concentrate on hardware infrastructure investments (similarly to cloud service platforms at the moment) while a wide diversity of other players, incumbents as well as many new entrants, are likely to address market needs in the upper layers: namely software development, virtual connectivity services, and the actual applications. Already now there are new types of operators and business models (e.g. wholesale-only, independent tower companies (“towercos”), infrastructure sharing, co-investment). New cooperation models or consolidation trends might emerge from business ecosystems. Existing providers of ECNs will likely need or want to adapt to the new paradigm, possibly not only as connectivity providers but also as infrastructure-as-a-service provider or even innovative software provider.

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[6] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions of 29 January 2020 on Secure 5G deployment in the EU - Implementing the EU toolbox, COM(2020) 50 final, 29.1.2020.

[7] Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union, amending Regulation (EU) No 910/2014 and Directive (EU) 2018/1972, and repealing Directive (EU) 2016/1148 (“NIS 2 Directive”), OJ L333, 27.12.2022, p. 80.

Questions

1. Which technological developments do you expect will have the largest impact on the electronic communications sector in the next 10 years? [We plan to report on the top 5 developments]

Use drag&drop or the up/down buttons to change the order or accept the initial order.

- Network virtualisation
- Open networks / network disaggregation and cloud RAN
- Edge cloud
- Artificial intelligence
- Terahertz communications (6G)
- Low orbit satellite communications
- Super precise geo-location
- Blockchain technology
- Quantum encryption
- Longer lasting battery technology
- Non cellular technologies[8]
- Other

Please specify "Other"

100 character(s) maximum

Cloudification: network functionalities are being migrated to cloud infrastructure

Please explain your answer

1000 character(s) maximum

All of these technological developments are relevant to consider in the light of the future of electronic communication networks, next to a lot of other technological developments. We consider these developments interrelated and of different orders. Therefore we cannot put these in a meaningful hierarchical order. Rather than reporting on distinct developments in isolation, we would welcome a more holistic approach of the technical (and social) developments in relation to one and other.

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[8] Examples of cellular networks are the well-known 2G, 3G, 4G and 5G mobile communication networks. In addition to these networks, other, non-cellular ones, exist in which the service area is not divided in separate and distinct cells. Some examples of these technologies are Wi-Fi and DECT. These non-cellular technologies are already in use for IoT and M2M connectivity (for example LoRa and Sigfox technologies) and are expected to act as predominant enablers of IoT in the future.

2. From a global/strategic perspective, which challenges and opportunities will these technological advances entail for the electronic communications sector?

1000 character(s) maximum

It's important to not define the 'electronic communication sector' to narrowly, this sector already entails much more than just the traditional telecom operators. Going forward boundaries between the traditional telecom operators and other players are likely to get more blurred. This should be reflected in the scope.

3. What are the most urgent problems to address in terms of unleashing the full technological potential of electronic communications and what (structural) impact will the future developments identified in Q.1 have on electronic communications networks? (e.g. on the type/quality of the connectivity, on the networks' architecture /functioning, on the provision model for connectivity, other)

1000 character(s) maximum

One of the largest challenges regarding unleashing the full technological potential of electronic communications is to ensure the supportive regulatory framework that's pro-competitive and aimed at promoting innovation rather than protecting existing business models.

The long term trends will likely change the roles of traditional telecom operators and other market players in the value chain. A defensive, protectionist approach can look attractive at the short run but is likely to much more harm than good on the longer run as these changes are inevitable and imply both opportunities and threats.

4. What impact will the future developments identified in Q.1 have on providers of ECNs or on other infrastructure investors? (e.g. role, business models, investment efforts, transformation/development opportunities) [Multiple answers possible]

- [x] Role
- [x] Business models
- [ ] Investment efforts
- [ ] Transformation/development opportunities
- [ ] Other

Please explain your answer

1000 character(s) maximum

See our previous answer. Roles and business models have changed and will inevitably continue to change, although traditional telecom operators are likely to keep their strategic position stemming from their termination monopoly. We expect attractive business models will remain for both ECN's (regardless of which shape or form these will take) and other infrastructure investors.

5. What impact will the future developments identified in Q.1 have on digital/online players or on other industrial players? (e.g. role, business model, investment efforts, development opportunities, other) [Multiple answers possible]

- [x] Role
- [x] Business models
- [ ] Investment efforts
- [ ] Transformation/development opportunities
- [ ] Other

Please explain your answer

1000 character(s) maximum

See our previous answer, as boundaries between various players get blurred, the distinction between 'providers of ECNs or on other infrastructure investors' and 'digital/online players or on other industrial players' is not necessarily the most useful. The implicit assumption in this question seems to be that 'digital /online players or on other industrial players' don't invest in infrastructure (as the previous question (Q4) covers explicitly 'ECNs or other infrastructure investors'. However, it's likely that both 'of ECNs or other infrastructure investors' (Q4) and 'digital/online players or other industrial players' (Q5) will contribute to investments in infrastructure in terms of both hardware and software.

6. What are your views with regard to the evolution of the energy consumption and the respective environmental footprint (notably CO2 emissions) of the main technological blocks of the future networks (copper, fibre, 5G, 6G, edge clouds, etc.), notably in terms of their operation? [Substantiate your answer as much as possible.]

1000 character(s) maximum

We consider it important that any conclusion in this area will not be based on just stakeholder views, but on facts from independent research. On FttH networks higher traffic loads generally do not lead to higher energy consumption. For mobile networks the relation between increased network loads and higher energy consumption is stronger, but at the same time consecutive generations of mobile technologies have succeeded in managing high growth of the network load while keeping energy consumption in check. The edge-cloud continuum might also facilitate further optimization of energy consumption as distributed architecture will make it possible to process and store data closer to end-user, avoiding transmission to higher network levels. In general we have observed that despite consistently strong data growth of the past 20 years, energy consumption has been kept in check relatively well. NL telecom operators have reported significant reductions in the last decade

7. Digitalisation is an important enabler of green and sustainable ambition. The increased use of digital technologies is expected to reduce the environmental footprint of many sectors. At the same time, the expected increase in data traffic may increase the environmental footprint of electronic communications. In your view, what will be the overall impact on the environment? [Only one option can be selected]

- (•) Significantly positive

- Moderately positive
- Negative
- Significantly negative
- Do not know

Please explain your answer, and if possible, support your answer with concrete figures and/or measurements

1000 character(s) maximum

As pointed out before, over the past decades we have observed that energy consumption has been kept in check, despite the impressive, consistently high year on year data growth rates. There seems to be no reason to assume that this will not hold for the foreseeable future. We need to strive to not just keep energy consumption in check, but rather decrease the total energy consumption. It's important to approach this in a holistic manner, and look at the entire ecosystem, including devices.

The attention to making networks and devices more energy efficient (which is very important) should not deflect from the fact that the footprint of networks is dwarfed by the potential reductions in the footprint of other sectors it can help reduce. Furthermore, we should be aware that particularly the energy consumption associated with connected end-user devices can be substantial, compared to energy consumption of networks.

More reliable data on energy consumption is desirable.

8. How do you expect ECNs to evolve/transform in the next 10 years and how will this evolution affect your business?

Please explain your answer

1000 character(s) maximum

It's likely that traditional ECNs will keep a strong position in the internet ecosystem as they are likely to continue their control over the last mile and as such can exert market power as gatekeepers between end-users and online service providers. This will likely allow them to keep on maintaining and expanding their access networks. At the same time it's likely that the trend of other market players building out their infrastructure nearer and nearer towards the end-user will continue.

Depending on how this will play out – there are a lot of different scenario's conceivable –questions will be raised relating to market structure, competition and strategic autonomy.

9. What are in your view the key future market developments that are likely to significantly impact the electronic communications networks, their architecture and/or their function? [We plan to report on the top 5 developments]

Use drag&drop or the up/down buttons to change the order or accept the initial order.

⠿ Development of independent infrastructure management companies

⠿ Emergence of virtually integrated network management entities (virtual network operators)

⠿ Network slicing services

⠿ Private local networks

⠿ Other

Please specify "Other"

100 character(s) maximum

Please explain your answer

1000 character(s) maximum

We need to abstain from providing such a 'top 5' as we feel this would not pay justice to the larger picture we need to look at. Rather than zooming in on a relatively idiosyncratic selection of developments (which are not clearly defined here) it would be more relevant to describe the developments on a higher aggregation level and reflect on possible scenario's rather than trying to make predictions. The developments mentioned are also highly intertwined and should not be regarded as separate developments. These developments might be considered particularly relevant from the current perspective of traditional telecom operators, but do not necessarily capture the developments from a broader, more holistic perspective. As stated before, the electronic communication markets entail much more than just traditional telecom operators.

10. Are there major obstacles to establish standards in relation to network access protocols and application programme interfaces (APIs) in order to support new service models and/or new network architectures?

- ○ Yes
- ◉ No

Please explain your answer

1000 character(s) maximum

We don't not recognize any major obstacles to establish new standards or, as is our more preferred option, evolve existing network protocol standards, considering those discussions take place in the appropriate organizations and involves all stakeholders.

One of our key concerns on this topic is that the established mandates of the consortia, partnerships, multi-stakeholder organizations and international multilateral SDOs need to be respected and - where a topic under consideration for standardization involves multiple organizations - the matter is resolved in the spirit of full and open collaboration instead of competition around competencies.

We're a keen supporter of the multistakeholder model and we like to see this reflected in matters concerning standardization in the digital domain. Such standards should be developed in an open, transparent process that involves all stakeholders, with the decisions based on consensus amongst all participants.

11. What additional needs compared to today's baseline do you expect will be needed for strengthening cybersecurity / network resilience and the related expected costs (e.g. in terms of CAPEX, other) for the next five years, including as regards replacement of high-risk vendors? [Fill in the table and substantiate your answer as much as possible.]

	Description of additional needs	Expected costs in EUR million for next 10 years
1		
2		
3		
4		
5		

Please explain your answer

1000 character(s) maximum

The responses to this question should be taken with extreme caution, as it's difficult for individual businesses to make an accurate estimate of these figures. From a methodological point of view, it's a concern that the scope / definition of 'cyber security' or 'network resilience' costs is not clearly defined. This will likely lead to very different interpretations among respondents. In addition CAPEX are investments and cannot be considered to be costs. The inputs on this question cannot be considered sufficient reliable or meaningful to draw conclusions from.

12. What are the strengths, weaknesses, opportunities, and threats ("SWOT") for the providers of electronic communications networks that shape their current and future operations?

Please describe Strengths, and explain your answer

1000 character(s) maximum

Strengths:

- Solid margins thanks to decreasing costs and stable ARPU's over the last decade.
- Predictable data growth and CAPEX requirements.
- Strategic position ("gate keeper role") between end-user and CAP's ("termination monopoly") through the last mile.
- Indispensable service for every consumer and business.

Please describe Weaknesses, and explain your answer

1000 character(s) maximum

Weaknesses:

- ECNs are traditionally good in technology deployment but innovation mainly driven by suppliers – this is inherent to most network industries.

Please describe Opportunities, and explain your answer

1000 character(s) maximum

Opportunities

- Continue to capitalize on crucial position in ecosystem to adapt to and support the digital transformation.

Please describe Threats, and explain your answer

1000 character(s) maximum

Threats

- Other types of players have been getting more and deeper involved in parts of the traditional telecommunication value chain, it can be expected that this trend where traditional boundaries get blurred will continue going forward. This can raise threats to some traditional providers, but also opportunities given their strategic position in the ecosystem.

13. How could providers of electronic communications networks best adjust to the on-going and future technological and market changes and be able to better compete globally and attract investors? [We plan to report on the top 5 developments]

Use drag&drop or the up/down buttons to change the order or accept the initial order.

- By delayering / asset reorganisation
- By entering new segments across the internet value chain
- By entering into cooperation/partnerships with actors from other segments of the internet value chain
- By network sharing
- By implementing innovative changes to the networks architecture or function
- No structural change required
- Other

Please specify "Other"

100 character(s) maximum

Please explain your answer

1000 character(s) maximum

The underlying assumption seems to be that telco's are facing a situation fundamentally different from the past, which is far from obvious. In addition, the notion that telco's should "be able to better compete globally and attract investors" both includes an unsubstantiated underlying assumption that European telco's compete (or should compete) on a global scale and that they should 'better attract investors'. We consider ECN providers perfectly capable of determining their own strategies. We therefore don't find it appropriate for us or the European Commission to reflect too much on strategies these private companies should pursue. It's also important to keep in mind that protecting current or future business models of ECN providers should never be a goal in itself. By not defining any problem first there's a significant risk that the Commission will not focus on individual interests of ECNs rather than addressing market failures, to the detriment of European consumers and businesses

14. What would be the barriers to achieve the needed transformations [Use the number scale to select the level for each option]

Legal /administrative

0

Economic

0

Technological

0

Lack of R&D

0

Other

0

Please specify "Other"

100 character(s) maximum

Please explain your answer, in particular specifying how significant the barrier would be in your view

1000 character(s) maximum

This question refers to “the needed transformations” and presumes there are “barriers to achieve these”. We don’t see a priori that there are any “needed transformations” and we consider it preconceived that the question already presumes that there are all kinds of ‘barriers’. By assuming that there are barriers, the question seems to imply there must be some form of market failure. However, without a clear and validated problem definition and problem analysis no conclusions can be drawn regarding any market failure. The consultation should therefore have focused on questions to objectively explore whether there is a problem in the first place, and if so what that problem is, and what its causes are.

15. What would be the expected yearly investment required to achieve the needed transformation of your company over the next five years? (In EUR million, and in % as percentage to the company yearly revenue).

% of yearly investment required relative to company yearly revenue

0

Average yearly investment required in EUR million

Please explain your answer

1000 character(s) maximum

This question is unlikely to lead to any accurate or meaningful answers. Most likely outcome of this question is that we will see relatively high, unreliable and unverifiable figures for the ‘needed transformation’ (which we consider too unconcise).

16. In your view, in which areas will investments be most required to achieve the needed transformation? Please quantify, where possible, the investment in each area [Use the number scale to select the level for each option]

Connectivity infrastructure

0

Edge cloud

0

Cybersecurity

0

Network management

0

Other

0

Please specify "Other"

100 character(s) maximum

Connectivity infrastructure investment required in EUR million

Edge cloud investment required in EUR million

Cybersecurity investment required in EUR million

Network management investment required in EUR million

Other (as specified above) investment required in EUR million

Please explain your answer

1000 character(s) maximum

This question is unlikely to lead to any accurate or meaningful answers. A likely outcome of this question is relatively high, unverifiable figures for the 'needed transformation' (which we consider too unconcise).

In addition the categories are also not clearly defined and leave considerable room for interpretation.

17. What will be the sources of revenues of the electronic communications sector and the ways to monetise the investments in business transformation over the next 10 years?

Please explain your answer

1000 character(s) maximum

This question is unlikely to lead to verifiable or meaningful answers. As pointed out above, we don't expect that the estimated investments for the 'needed transformations' are sufficiently sound to be used for policy decisions. In addition, the questions offer much room for respondents to give an answer which is in their specific interest.

18. Which cooperation models would you expect to see emerging or growing the most in the next 10 years?

Use drag&drop or the up/down buttons to change the order or accept the initial order.

- Network sharing
- Co-investment
- Cooperation with towercos
- Cooperation with vertical industries
- Cooperation with online players
- Cooperation with neutral hosts
- Mergers & acquisitions
- Other

Please specify "Other"

100 character(s) maximum

Please explain your answer, and describe what would be the challenges of these cooperation models?

1000 character(s) maximum

This question asks respondents to reflect on specific forms of co-operation of traditional ECN providers with other market participants. However as there's no clear, verifiable problem definition and problem analysis, we fail to see why it's relevant to explore these types of co-operation.

19. What funding mechanisms do you foresee as being currently able to finance the needed extra investments?

Please explain your answer

1000 character(s) maximum

The answer seems to presume that there are 'needed extra investments', despite the fact that over the last decades providers of electronic communication networks have been able to make the required investments. We consider it crucial that before this type of questions are asked, it is carefully substantiated why at this point in time – as a break with the past - it would no longer be possible for providers of electronic communication networks to fund their investments. In addition, we don't consider this consultation suitable to collect reliable, meaningful quantative data on 'needed investments'.

20. Do you expect vertical industries to contribute significantly to investments in new digital infrastructures (e.g. for automated driving, manufacturing & logistics, health applications)? If so, please describe how this may develop in terms of business /cooperation models. Mention also any obstacles that may exist to the development of such forms of raising financing, and how they could be resolved.

- Yes
- No

Please explain your answer

1000 character(s) maximum

At this stage there's no reason to assume investments in new digital infrastructures cannot be funded by providers of electronic communication networks, CAPs or vertical industries. Any claim that, contrary to the last decades there will be a market failure related to network investment need to be carefully substantiated. We expect that some respondents will claim that net neutrality prevents monetization of investments, as this has been consistently claimed over the last decade but has never been substantiated.

Section 2. Fairness for consumers

Under the current regulatory framework for electronic communications, the universal service rules ensure that the public sector provides a safety net, set at the Union level, to ensure that at least the minimum electronic communications services (broadband internet access and voice communications) are available to all consumers and at an affordable price. Member

States can fund these "**universal service obligations**" using public funds or by setting up a sharing mechanism between providers of electronic communications.

Universal service focuses on the **affordability** to consumers with low income or special social needs. The current rules require Member States to ensure that consumers have access at an affordable price to an available adequate broadband internet access service at a fixed location. Affordability is ensured with support to consumers or with special tariff options or packages. The adequate broadband has been defined in different Member States to correspond to different bandwidths currently up to 30 Mbps for download.

To ensure general coverage, the market has a leading role to play in ensuring the **availability** of broadband. In areas where the market would not deliver, there are Union and national funds available. Universal service is used for the availability of a connection only where neither the market nor public funds have provided a connection and following an end-user request.

According to the 2022 Digital Economy and Society Index ("DESI") report,[9] at least one broadband internet access network is **available** to all households in the EU when considering all major technologies. Coverage of next generation access ("NGA") technologies capable of delivering download speeds of at least 30 Mbps reached 90% in 2021. Fixed very high capacity networks covered 70% of EU homes in 2021. Mobile 4G coverage of populated areas reached 99.8%. Broadband coverage of rural areas remains challenging as 8.5% of households are not covered by any fixed network. The **take-up** of fixed broadband was 78% of EU households in 2021. In 2021, 87% of people used a mobile device to access the internet.

However, some consumers, in particular persons with disabilities, still face barriers to access those networks and technological developments on equal basis with others.
In relation to **affordability**, at EU level, retail prices of fixed and mobile broadband offers became cheaper than previous year among all household baskets in 2021 [10] in each usage /speed category. The price decreases varied between different baskets from around 6.4% to over 13%.

The availability and affordability of broadband to European consumers benefit a wide range of players, including providers of online content, applications and services that also benefit from the opportunities and increased demand.

However, the current economic conjuncture, the rising inflation and cost of energy for the businesses, and some of the technological and market developments indicated in the previous section are likely to lead to upwards pressure on costs for consumers at least in the short term.

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[9] Available at https://digital-strategy.ec.europa.eu/en/policies/desi.

[10] See, the 2022 Digital Economy and Society Index, Connectivity study, “Mobile and Fixed Broadband Prices in Europe 2021”, available at https://digital-strategy.ec.europa.eu/en/library/mobile-and-fixed-broadband-prices-europe-2021.

Questions

21. In your opinion and considering the overall economic context, is the access to broadband at an affordable price for consumers likely to evolve in the next 10 years?

	Price	Likely to increase	Likely to remain the same	Likely to decrease	Do not know
Broadband speed up to 30 Mbps					
Broadband speed between 30 and 100 Mbps					
Broadband speed 1Gbps or above					

Please explain your answer

1000 character(s) maximum

We have seen prices increase moderately over the past 10 years, and as the total costs incurred by telecom operators have declined considerably (next generation networks are more cost efficient to maintain), margins have increased. As until now network costs have remained relatively constant over a long term - despite consistently high data growth - from a cost perspective there's no reason to expect higher prices. In addition, weve seen a consistent trend where subscriptions offer more bandwidth at the same price.

However, the future price development highly depends on the policy choices that will be made at the EU level. An EU policy approach aimed at protecting the private interests of large telco's (less competitive pressure) is likely to lead to significantly higher consumer prices. In other regions we observe that regulatory approaches that are less aimed at promoting competition, such as the US, lead to prices that can be more than twice as high as current EU price levels.

22. In your view, has the universal service regime been an efficient and effective tool in protecting consumers with low income or special social needs? [Only one option can be selected]

- (●) Significantly
- ( ) Moderately
- ( ) Little
- ( ) Not at all
- ( ) Do not know

Please explain your answer

1000 character(s) maximum

Universal service is an important last resort instrument when affordable connectivity services cannot be achieved through instruments that are aimed at promoting well-functioning markets. The EECC provides an adequate regime with good checks and balances for protecting consumers and promoting investment.

23. In your view, has the universal service regime been an efficient and effective tool to ensure equal access for persons with disabilities, including access to assistive equipment? [Only one option can be selected]

- (●) Significantly
- ( ) Moderately
- ( ) Little
- ( ) Not at all
- ( ) Do not know

Please explain your answer

1000 character(s) maximum

Significantly, in combination with innovative terminal equipment and applications.

24. In your view, does the universal service regime answer the future connectivity needs that should be ensured for all consumers? [Only one option can be selected]

- (●) Yes
- ( ) No
- ( ) Do not know

Please explain your answer. In case of a negative reply, please indicate which are are the possible shortcomings of the universal service regime.

1000 character(s) maximum

Yes: The question seems to imply that the universal regime is meant to ensure all of the future needs. However to the extent that the universal service regime can contribute to the wider objective to ensure access to future connectivity the universal service regime is fit for purpose.

25. In your view, what do the expected market and technological developments described in Section 1 mean for the universal service regime? [Only one option can be selected]

- (●) The current universal service regime should be maintained
- ( ) The universal service regime should evolve
- ( ) The universal service regime will not be needed
- ( ) Do not know

Please explain your response. In case of a positive reply, please indicate why the universal service should be maintained or in what ways the universal service regime should evolve? (e. g. its scope, its purpose, the contributors to its financing, the users that benefit from it, etc.)

1000 character(s) maximum

The basic principles of the current universal service regime are fit for purpose and should be maintained. Article 84 ensures that the bandwidth enjoyed by the majority of end users in the Member State - which evolves - is taken into account. The review procedure of article 122 of the EECC may be used to update the minimum set of services the adequate internet broadband access service should be capable of supporting EU wide (Annex V of the EECC).

26. The current source for financing the universal service in electronic communications is public general budget and/or financing from providers of electronic communications networks and services. What should be in your view the appropriate way for financing the universal service in electronic communications in the next 10 years? [Multiple options can be selected]

- [ ] Public general budget (as currently)
- [ ] Providers of electronic communications networks and services (as currently)
- [ ] Widen the range of providers to include online digital players or data generators that benefit from connectivity or only a set of them
- [ ] Other ways of financing

Please explain your answer

1000 character(s) maximum

We see no need for changes in the current financing of universal services.

Regarding Q.27: The questionnaire excludes us from replying to Q27. Although we answered that there is no justification to "widen the range of providers to include online digital players or data generators that benefit from connectivity or only a set of them" we would like to stress that any traffic related levy would be harmful to the European digital transition, as in Europe we want to promote the deployment and use of high capacity networks.

28. Outside universal service, could other means of support to consumers to ensure their affordable access to broadband be envisaged? [Only one option can be selected]

- (•) Yes
- ( ) No
- ( ) No opinion

Please explain your answer; if you reply yes, please explain which other means of support could be envisaged.

1000 character(s) maximum

Yes, from a policy perspective there are many ways to ensure affordable access to broadband. The most important set of instruments is to ensure effective competition. Limiting competition is likely to lead to higher prices and less incentives to invest.

29. Would a dedicated EU-wide fund be useful? [Only one option can be selected]

- ( ) Yes, it would be useful for support to ensure that consumers have affordable access to broadband in general
- ( ) Yes, it would be useful for support to ensure that consumers have affordable access to broadband only in specific crisis circumstances to address acute but temporary difficulties
- ( ) Yes, it would be useful for network deployment, especially in rural areas
- (•) No, it would not be useful

Please explain your answer; If you reply yes, please explain whether a distinction should be made between all consumers and those with low income or special social needs.

1000 character(s) maximum

No, at this stage there's no problem definition and problem analysis that indicates that an additional EU-wide fund is necessary or appropriate.

We consider it premature that such implementation details are asked about an instrument, without there being any problem definition. It's not possible to justify or reflect on such implementation details in any meaningful way if this cannot be related to any underlying problem definition. What is the market failure, and why is this instrument effective, efficient and necessary to address this particular market failure?

This question actually introduces a solution ("dedicated EU-wide fund") and then asks respondents what justification the Commission can use to justify the application of this instrument. This is clearly the wrong order. The consultation should not be about "solutions in search of problems" but about "finding solutions to clearly defined problems".

31. From an affordability perspective, what is your view regarding the retail price cap on intra-EU communications (i.e. EUR 0.19 per minute for calls and EUR 0.06 per SMS message, both excluding VAT) introduced by an amendment to the Open Internet Regulation, and which is set to expire on 14 May 2024?

- ○ No need for retail price regulation in the future
- ○ The current retail price regulation should be extended for some years
- ◉ The current retail price regulation should be maintained and adjusted
- ○ Other

Please explain your answer

1000 character(s) maximum

Section 3. Barriers to the Single Market

Regulatory intervention has so far been quite successful in lifting barriers to market entry in electronic communications fixed networks. The emergence of competition after regulatory intervention made it possible to reduce the number of markets that national regulators need to assess ex-ante from 18 retail and wholesale markets in the 2003 Recommendation to two fixed wholesale markets currently identified in the 2020 Recommendation. Still, some barriers persist in the fixed markets. As regards mobile markets, the ex-ante regulation of termination markets is no longer recommended due to the introduction of single Union-wide termination rates.

Looking at on-going and future developments, such as, Machine to Machine services, internet of things (IoT) deployment, virtualisation of networks, etc., the case for a full integration of the single market for electronic communications appears to be stronger. However, despite the Commission's aim to promote the EU single market, EU electronic communications markets remain essentially national, which prevents certain economies of scale from being achieved.

Roaming policy, an important step in lowering barriers to the EU single market, reflects the existence of separate national markets by allowing "roam like at home" to address periodic travel needs. The Roaming Regulation provides for safeguards to prevent abusive or anomalous use of roaming services abroad at domestic prices (such as permanent roaming); this is because, in the absence of a full integrated telecoms single market, such practices might put at risk the financial sustainability of such calls.

In addition, radio spectrum policy is a key element to boost EU competitiveness and innovation. Without pre-empting the need for a thorough analysis of the radio spectrum market in the EU, the question emerges to what extent the potential development of a more coherent radio spectrum market in the EU as opposed to the current fragmented national radio spectrum management practices (including e.g. concerning satellite communications and vertical use cases), can lead to more favourable investment conditions. Furthermore, in the context of a challenging geopolitical climate, the question arises whether it is necessary to update the existing spectrum governance framework so as to strengthen the EU strategic autonomy and reduce precarious dependencies.

Questions

32. What future developments in terms of technological developments, new applications, network architecture or functioning (or other) could further promote the development of the digital single market?

1000 character(s) maximum

Whereas connectivity, by nature, is usually still offered as a national proposition, just as utility services such as water, electricity and gas, content and services are increasingly offered on a pan-European and even global scale. Although this question asks how the development of the 'digital single market' could be further promoted, in reality the question seems to be about a subset of the 'digital single market', namely the markets for electronic communication services. Before the question can be asked how a single market for ECS can be promoted, it's important to assess whether the current lack of "pan-European" connectivity propositions / telecom operators is hindering the wider digital single market. However, the consultation leaves open why and how these developments are making the case for "full integration of the single market for electronic communications" stronger.

33. In your view, are there obstacles to the full integration of the single market for electronic communications? If so, please explain what, from your point of view those obstacles are (do they relate to the rules governing the general authorisation, the application of the country of origin/country of destination principle with respect to supervisory rules, the bodies in charge of monitoring and enforcement, etc.)? If you consider no obstacles to the full integration of the single market exist, what would be in your view the reasons why providers of ECNs generally do not offer their services EU-wide?

1000 character(s) maximum

It's important to clearly define what's exactly meant by 'full integration'. 'Full integration' can mean a lot of different things, and a more extreme interpretation would be a situation where there would be only room for a handful very large pan-European network operators, offering a uniform service portfolio across all member states. Such a market structure would then more resemble the market situation in the United States. By their very nature, access networks have a local presence. IAlthough it's likely that through cross-border mergers some synergies can be achieved, these will be likely to be confined to very specific activities such as R&D and procurement (and therefore relatively small). We see no major obstacles to cross-border mergers, however synergies seem relatively limited.

34. Are there identifiable/expected cost savings or other efficiencies that could arise from the EU-wide deployment of infrastructure and/or provision of services by providers of ECNs? If so, please describe the type/category of cost savings (e.g. in terms of network management, service provision, regulatory cost savings, administrative burdens, etc.).

[Fill in the table and substantiate your answer as much as possible.]

Type/category of cost savings	Expected cost savings in EUR million for the next 10 years
Network management	
Service provision	
Regulatory	
Administrative burdens	

Provide further responses if necessary

	Type/category of cost savings	Expected cost savings in EUR million for the next 10 years
1		
2		
3		
4		

Please explain your answer and provide a quantification, if possible.

1000 character(s) maximum

As pointed out before, it's widely agreed that the synergies of cross-border mergers of telecom operators is relatively limited compared to in-market consolidation. The reason for this is that most costs are related to the access network. In-market consolidations allow for a more efficient use of the access network (cost synergies) and for reducing competition (price synergies).

We would urge the Commission to interpret the estimates of respondents with caution. This question is unlikely to lead to any accurate or meaningful answers. We cannot rule out that the outcome of this question is that we will see relatively high, unreliable and unverifiable figures for cost savings – despite the commonly accepted insights that cross border synergies are relatively limited.

35. In your view, do obstacles exist to cross-border consolidation of electronic communications providers in the EU? If you consider that obstacles exist, please describe the type/category of obstacles and indicate what steps/actions could be taken to remove these. What opportunities for cost savings could result from cross-border consolidation if those obstacles were removed?

1000 character(s) maximum

We see no major obstacles to cross-border consolidation and technical and commercial integration, but the synergies of this are also relatively limited.

36. In your view, could there be benefits from a (more) integrated radio spectrum market in the EU? If yes, please explain what those benefits would be and, as far as possible, quantify those benefits. What steps/actions could be taken to promote a more integrated radio spectrum market in the EU?

1000 character(s) maximum

The current system of EU harmonization of spectrum followed by authorization by MS strikes to a good balance between need for common European spectrum policy and need to differentiate between MS. The current system of harmonization within the EU ensures that frequency use between MS is aligned, so that same equipment can be used throughout EU to create economies of scale, and interference issues are minimized. Authorization by the MS makes it possible to tailor the award policy to individual MS. Due to differences in eg population density or existing frequency use not all MS will have same need for same spectrum at same time. Further integration of radio spectrum market will result in less flexibility to adapt to specific situation in a MS.
A more central approach will favour large parties to which spectrum licenses have been awarded. This will reduce possibilities for competition in market by smaller players, which is likely to result in higher prices, less innovation and investment

37. In your view and without prejudging any policy direction, what would be the added value, risk and cost of implementing a common EU-level licensing/authorisation scheme for spectrum use in well justified cases (e.g. cross-border reach of infrastructure/service, significant added value of an EU joint authorisation scheme compared to individual Member State authorisations)? Please indicate the areas in which such a scheme would be most useful (e.g. in cases of satellite communications and/or vertical use cases).

1000 character(s) maximum

We are of the opinion that the risks and costs of a common EU-level licensing/authorization scheme are likely to outweigh the benefits. A common EU-level licensing/authorization scheme could in principle make it easier to arrange the spectrum use for applications with an international footprint, such as satellite communications or transport. However, not all EU member states will have the same spectrum need at the same time. It is unclear if a common EU-level licensing/authorization scheme can deal with such differences between member states. For instance, even applications with a strongly international footprint will often not be used in all EU countries. Furthermore, the current system of EU harmonization of spectrum and licensing on the national level can already ensure similar results, as illustrated by the fact that e.g. trains can use the same frequency band throughout the EU.

38. Do you consider the participation of non-EU countries or entities in technical preparatory work for EU decisions on spectrum harmonisation or international negotiation matters on spectrum (such as e.g. within the European Conference of Postal and Telecommunications Administrations (CEPT)) as a potential issue of concern for EU sovereignty, resilience or security? If yes, to what extent is it a concern? Please indicate what institutional structures or mechanisms would be best suited to allow the EU to monitor spectrum policy matters in international organisations, and to undertake the technical preparations concerning the Union's decision-making process including before and during international negotiations concerning spectrum policy matters?

1000 character(s) maximum

The current participation of non-EU countries in technical preparatory work for EU spectrum decisions (such as e.g. in CEPT) is not an issue for EU sovereignty, resilience or security. Current geopolitical developments should not be reason to change way in which we cooperate in area of spectrum use. On the contrary, it's important EU neighbours remain involved in this work, and are committed to the EU harmonization decisions. Involving experts and representatives of the 46 CEPT administrations in spectrum harmonization and related matters remains key. Being part of a larger region strengthens the EU in international negotiations. We note CEPT in the context of the ITU is recognized as the RTO and in this role remains the most important interface for the European administrations to ITU. The current process of preparing a EU Council decision for a WRC is based on advice of the RSPG, the high-level advisory group of the EU member states which takes care of any specific EU interests.

39. In your view, what would be the added value, risk and cost of addressing cases of radio frequency interference in EU Member States from third countries (notably those that may potentially have serious effects on more than one Member State) only at EU level (i.e. whereby the EU acts in unity) instead of at the level of each affected Member State (acting individually)?

1000 character(s) maximum

The added value of addressing radio frequency interference issues from third (non-EU) countries is specifically seen for those cases where the issues concern more than one member state. In such cases, a coordinated approach at EU level could provide added value. In cases where the issues concern only one member state, these issues could in principle be addressed by this member state and an approach at EU-level should be considered only if this does not lead to a solution for the issue, or if the affected member state requests assistance. Following up on question 38, please note that a continued focus to align EU and -among others- CEPT harmonization interests contributes to better cross-border coordination amongst EU Member States and countries outside the EU with less probability of unwanted interference.

Section 4. Fair contribution by all digital players

The amount of data exchanged – and harvested – is larger than ever and will increase, as the global consumer internet traffic has grown with 34.4 % CAGR since 2015.[11] The metaverses and virtual worlds, the rapid move towards cloud, the use of innovative technologies online are making this even more evident. However, there also seems to be a paradox between increasing volumes of data on the infrastructures and alleged decreasing returns and appetite to invest in network infrastructure. Some electronic communications operators, notably the incumbents, call for the need to establish rules to oblige those content and application providers (“CAPs”) or digital players in general who generate enormous volumes of traffic to contribute to the electronic communications network deployment costs. In their view, such contribution would be “fair” as those CAPs and digital players would take advantage of the high-quality networks but would not bear the cost of their roll-out.

Conversely, CAPs and other digital players argue that any payments for accessing networks to deliver content or for the amount of traffic transmitted would not only be unjustified, as the traffic is requested by end-users and costs are not necessarily traffic sensitive (notably in fixed networks), but would also endanger the way the internet works and likely breach net neutrality rules.

Other stakeholders caution against rushed regulatory intervention. Some stakeholders argue that an accurate management of data traffic could have a positive impact on the environmental footprint of data traffic. This discussion has to be seen also in light of the European Declaration on Digital Rights and Principles,[12] which includes a statement according to which all market actors benefiting from the digital transformation should assume their social responsibilities and make a fair and proportionate contribution to the costs of public goods, services and infrastructures, for the benefit of all people living in the EU. In the

European Declaration on Digital Rights and Principles, emphasis is also put on the protection of a neutral and open internet where content, services, and applications are not unjustifiably blocked or degraded, which is already enshrined in the Open Internet Access Regulation.

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[11] GSMA: The Internet Value Chain 2022 – May 2022.

[12] Chapter II, 2(c) of the European Declaration on Digital Rights and Principles for the Digital Decade, available online at: https://ec.europa.eu/newsroom/dae/redirection/document/92399.

Questions

40. Quantify (in EUR million), as in the format below, your direct investments in network infrastructure and/or other digital infrastructure capable of optimizing network traffic within or relevant for the EU Member States for every year between 2017 and 2021. Please provide separate figures for each infrastructure category, both in absolute terms and as percentage of the revenues generated within the EU each year (here "network infrastructure" is to be understood in broad terms, e.g. at several different network layers, core, distribution and access network, including even undersea cables; "other digital infrastructure" is also to be interpreted broadly, e.g. hosting, data transport, data centres, CDNs, etc.)

Please provide estimates for every year between 2017 and 2021.

	Specify other network /digital infrastructure you provide data for	2017	2018	2019	2020	2021
Core network						
Distribution network						
Access network						
Undersea cables						
Other network infrastructure (please specify)						
Other network infrastructure (please specify)						
Other network infrastructure (please specify)						

Hosting infrastructure						
Content delivery networks						
Data centres						
Data transport						
Other digital infrastructure (please specify)						
Other digital infrastructure (please specify)						
Other digital infrastructure (please specify)						

Total direct investment in network infrastructure and/or other digital infrastructure made in 2021 capable of optimizing network traffic in EUR million within or relevant for the EU Member States.

million EUR

In 2021, as a percentage to the revenues generated within EU Member States:

- 0-5%
- 6-10%
- 11-15%
- 16-20%
- Over 20%

Please explain your answer

1000 character(s) maximum

This question seeks to retrieve reliable, complete and accurate data on network investment by European actors. It would be highly advisable to collect this information through regulatory authorities as they not only have considerable experience with reliable methodologies, but also have the legal competence to require data, including the possibility to enforce. If this is not feasible, the Commission could revert to publicly available data, which is likely to be more reliable and allows for using multiple sources. We see no possibility for the Commission to validate the input from individual respondents. Respondents are likely to make different interpretations as there are no definitions provided. It's not clear how the Commission will ensure completeness, in the sense that all parties will submit their investment data, including alternative operators. Many investments are done by other entities such as public bodies, joint ventures or financial institutions such as pension funds.

41. What are your total planned future investments in network infrastructure and/or other digital infrastructure capable of optimizing network traffic from today until 2030 within or relevant for the EU Member States? Please specify both in absolute terms (in EUR million) as well as percentage increase compared to previous years.

Please provide estimates for every year between 2022 and 2030.

	Specify other network /digital infrastructure you provide data for	2022	2023	2024	2025	2026	2027	2028	2029	2030
Core network										
Distribution network										
Access network										
Undersea cables										
Other network infrastructure (please specify)										
Other										

network infrastructure (please specify)										
Other network infrastructure (please specify)										
Hosting infrastructure										
Content delivery networks										
Data centres										
Data transport										
Other digital infrastructure (please specify)										
Other digital infrastructure (please specify)										

Other digital infrastructure (please specify)										

Total direct investment in network infrastructure in million EUR within or relevant for the EU Member States in 2022

EUR million

Planned future total direct investment in network infrastructure in million EUR within or relevant for the EU Member States in 2023

million EUR

In 2023, as a percentage to the revenues generated within EU Member States:

- 0-5%
- 6-10%
- 11-15%
- 16-20%
- Over 20%

Please explain your answer, and upload proof of data justifying it (e.g. official presentations to financial investors, board of directors, etc.)

1000 character(s) maximum

See our previous answer: This question is unlikely to lead to reliable, complete and accurate data on network investment by European actors. There's no possibility to validate the input from individual respondents. It would be highly advisable to collect this information through regulatory authorities.

In addition the reported input to this question will not show whether the traffic distribution is done in an optimal way by the network making the investment. Some telecom operators have caches of streaming services and CDNs deep in their network. Others chose to route everything centrally and spend significantly more as a result on backbone capacity. What is most optimal is in practice decided by network engineers and finance departments.

42. Indicate how much the share of network investments that you indicated in response to Q40 has exceeded the investments you planned, including when they depended on regulatory obligations (e.g. radio spectrum), over the last 5 years.

For fixed network investment costs:

- 0 - 20%
- 21 - 40%
- 41 – 60%
-

61 - 80%

Over 80%

For mobile network investment costs:

0 - 20%

21 - 40%

41 – 60%

61 - 80%

Over 80%

Please explain your answer, providing a separate assessment for fixed and mobile networks

1000 character(s) maximum

From a methodological point of view, spectrum fees cannot be mixed with network investment. The prices bidders are willing to pay in spectrum auctions are based on the expected future returns. From a methodological point of view spectrum fees should therefore be isolated from the network investments.

This question to what extent network investments have exceeded expectations can be very easily answered. As pointed out above, network CAPEX by telco's has been surprisingly stable over the last >10 years. The fluctuations between predicted CAPEX and realized CAPEX are therefore generally relatively low, in particular for the ETNO members.

43. Quantify the increase of traffic transmitted (inbound/outbound) through your networks over the last five years on a year-on-year basis. Please indicate the main sources of data and the share of traffic using CDNs. Please reply to this question by indicating the 10 largest contributors by name and provide the % of total traffic they generated in your network.

1st largest contributor:

100 character(s) maximum

Share of 1st largest contributor:

Only values between 1 and 100 are allowed

%

2nd largest contributor:

100 character(s) maximum

Share of 2nd largest contributor:

Only values between 1 and 100 are allowed

%

3rd largest contributor:

100 character(s) maximum

Share of 3rd largest contributor:

Only values between 1 and 100 are allowed

%

4th largest contributor:

100 character(s) maximum

Share of 4th largest contributor:

Only values between 1 and 100 are allowed

%

5th largest contributor:

100 character(s) maximum

Share of 5th largest contributor:

Only values between 1 and 100 are allowed

%

6th largest contributor:

100 character(s) maximum

Share of 6th largest contributor:

Only values between 1 and 100 are allowed

%

7th largest contributor:

100 character(s) maximum

Share of 7th largest contributor:

Only values between 1 and 100 are allowed

%

8th largest contributor:

100 character(s) maximum

Share of 8th largest contributor:

Only values between 1 and 100 are allowed

%

9th largest contributor:

100 character(s) maximum

Share of 9th largest contributor:

Only values between 1 and 100 are allowed

%

10th largest contributor:

100 character(s) maximum

Share of 10th largest contributor:

Only values between 1 and 100 are allowed

%

Please explain your answer

1000 character(s) maximum

The requested traffic data will not give a meaningful insight in any incremental costs that can be associated with the reported volumes. Total amount of traffic is not relevant from a network cost point of view. Peak traffic, not 'total traffic' is driving network costs . Apart from this, it's important to distinguish between types of traffic, as the costs of traffic highly depend on the specific characteristics. Streaming traffic that can be buffered (not time critical) is very cost-efficient (highly adaptive in case of congestion). More costly from a network perspective is traffic that is time critical, such as a real time stream of a sports event or a video call. Also more costly is relatively peaky and unpredictable traffic. Even if this burst-like traffic has a relatively low average bit rate, the sudden peaks imply the network needs to be dimensioned relatively large. And of course costs of fixed and mobile traffic differ significantly.

44. New compression algorithms can (partly) compensate for the increase in data traffic demanded by the upgrades and the advancements in the relevant products and technologies. Over the last 5 years, what are the changes in your volume of data transmitted over your part of the "network layers" resulting from the evolution of compression algorithms?

- No significant change
- Decreased up to 5%
- Decreased by 6-10%
- Decreased by 11 – 15%
- Decreased by over 15%

Please explain your answer

1000 character(s) maximum

This question is unlikely to lead to reliable, complete and accurate data on network investment by European actors. There's no possibility to validate the input from individual respondents. See also the concerns we raised regarding the previous questions in this section.

45. In your view, what is the future outlook in terms of annual peak time traffic growth until 2030?

- No change
- Compound Annual Growth Rate (CAGR) up to 10 %
- CAGR 11-20 %
- CAGR 21-30 %
- CAGR 31-40 %
- Over 40% CAGR

Please explain your answer

1000 character(s) maximum

This question is unlikely to lead to accurate or meaningful insights. Traffic growth has been relatively consistent over many years, in case respondents assume that this consistent growth trend will be broken this needs to be extensively substantiated. It would have been logical if the questionnaire also had asked from respondents to report their historic growth, this would have allowed for a comparison between past growth and projected growth for individual stakeholders.

46. Please specify the fees paid to providers of ECNs within EU Member States cumulatively for the last 5 years and provide an outlook for the next 5 years.

	2017 (actual)	2018 (actual)	2019 (actual)	2020 (actual)	2021 (actual)	2022 (actual)	2023 (planned)	2024 (planned)	2025 (planned)	2026 (planned)	2027 (planned)
Transit fees (Euros)											
Transit fees as % of total revenues in EU MS											
Paid peering fees (Euros)											
Paid peering fees as % of total revenues in EU MS											

Please explain your answer, and if possible indicate the data source

1000 character(s) maximum

The Commission should be aware that it will be difficult to ensure this auto reported data is complete and reliable.

In addition it’s evident how this data needs to be interpreted. Transit is the cost of carrying traffic over one network to all other networks and as a result is only there to cover the costs of the intermediairies. Paid peering can in practice be the result of exercising market power by the terminating peer. On the other hand paid peering can sometimes be presented as a transit fee.

47. Indicate your share of traffic (sent or received) through transit and peering for the last 5 years and provide an outlook for the next 5 years.

	2017 (actual)	2018 (actual)	2019 (actual)	2020 (actual)	2021 (actual)	2022 (actual)	2023 (planned)	2024 (planned)	2025 (planned)	2026 (planned)	2027 (planned)
% of transit within inbound traffic											
% of free peering within inbound traffic											
% of paid peering within inbound traffic											
% of transit within outbound traffic											
% of free peering											

within outbound traffic											
% of paid peering within outbound traffic											

Please explain your answer

1000 character(s) maximum

The Commission should be aware that it will be difficult to ensure this auto reported data is complete and reliable.

As to our knowledge almost all of the of peering relations are on a handshake basis and the direction of traffic being irrelevant to the cost of networks, it’s not evident to us how this question can lead to meaningful insights.

48. Indicate your charging methods and the general pricing trend(s) on the IP market (increases/decreases/stable), particularly the proportion of paid peered traffic for the previous 5 years and provide outlook for the following 5 years.

Transit price change:

	2017 (actual)	2018 (actual)	2019 (actual)	2020 (actual)	2021 (actual)	2022 (actual)	2023 (planned)	2024 (planned)	2025 (planned)	2026 (planned)	2027 (planned)
Decrease by more than 10 %											
Decrease by 1 - 10 %											
No change											
Increase by 1 - 10 %											
Increase by more than 10 %											

Paid peering price change:

	2017 (actual)	2018 (actual)	2019 (actual)	2020 (actual)	2021 (actual)	2022 (actual)	2023 (planned)	2024 (planned)	2025 (planned)	2026 (planned)	2027 (planned)
Decrease by more than 10 %											
Decrease 1 - 10 %											
No change											
Increase by 1 - 10 %											
Increase by more than 10 %											

Please explain your answer

1000 character(s) maximum

The Commission should be aware that it will be difficult to ensure this auto reported data is complete and reliable.

49. Specify the threshold above which you would consider a company to constitute a so-called large traffic generator ("LTG") based on the percentage level of traffic loaded on your network during peak time traffic (or any other classification that you may use). You should refer to this categorization method in all questions referring to LTGs.

Please explain your answer

1000 character(s) maximum

See before, the term LTG is not a neutral term as traffic is generated by end-users. In addition, there are numerous different traffic characteristics that determine the incremental costs as pointed out before (fixed vs mobile, streaming vs. burst, realtime vs not time-crtical, etcetera)

50. In your view, over the last 5 years how have LTGs' investments in digital infrastructure and other innovations (e.g. evolution of compression algorithms) impacted the costs of network deployment investments of the network operators related to the increase of data traffic?

- They increased by 20% or more
- They increased up to 20%
- They did not change
- They decreased by up to 20%
- They decreased by 20% or more

Please explain your answer

1000 character(s) maximum

Instead of asking this from respondents with a) limited visibility on the relationship between network costs and investment by third parties and b) specific interests that might influence the answers this information can be best gathered from independent sources / experts.

From a methodological point it's a concern that every respondent will hold a different definition of LTG's, which will in itself lead to unreliable answers.

51. What is today the share of your network investment incremental costs caused by the increases of data traffic coming from LTGs, you defined in Q49? What was this share 10 years ago and how is it expected to evolve in the next 10 years? Please provide a separate assessment for fixed and mobile networks.

For fixed network investment costs:

	In 2012	In 2022	In 2032
0 - 20%			
21 - 40%			
41 – 60%			
61 - 80%			
81 - 100%			

For mobile network investment costs:

	In 2012	In 2022	In 2032
0 - 20%			
21 - 40%			
41 – 60%			
61 - 80%			
81 - 100%			

Please explain your answer, providing a separate assessment for fixed and mobile networks

1000 character(s) maximum

Estimating incremental costs is a highly complex, time-consuming and specialized activity as this information cannot be simply derived from cost accounting data. Usually this is done by regulators. A much more reliable way to get these answers on cost-volume relationships is to study existing literature and consult regulators and independent researchers. In addition it can be helpful to study the information that telecom operators share with investors, which is generally more reliable. The short run incremental costs are insignificant for fixed networks and relatively limited for mobile networks On the longer run, both fixed and mobile network costs tend to be more or less constant over time despite data growth.

52. Are there any obstacles preventing providers of ECNs from charging digital players for increased data traffic through their networks? [Only one option can be selected]

- No
- Yes
- I do not know

Please explain your answer. In particular, if you reply is yes, please explain the reasons (e.g. legal, regulatory, other)

1000 character(s) maximum

No. We find this question preconceived. There is no need for providers of ECNs to charge for increased traffic to 'digital players' as 1) increased data traffic has so far never led to significantly increased costs (why would providers of ECN's charge for increased data if this data does not lead to additional costs?) and 2) end-users already pay for the traffic they use through their subscription.

We see no economic or legal basis for providers of ECN's to charge for these costs, but we would not define the lack of a justification as an 'obstacle'.

53. What could be the effect on the environmental footprint of the services provided over electronic communications networks of a potential mechanism whereby the largest generators of traffic would contribute to network deployment, and/or would be subject to obligations regarding data delivery mode?

Please explain your answer

1000 character(s) maximum

From an economic perspective it would be misguided to apply a levy on data usage in order to decrease the footprint. To provide the right pricing signals / incentives to increase data efficiency, energy prices should reflect the external costs. Any argumentation to put a levy on data usage (rather than on energy consumption itself) seems quite very far-fetched and not supported by sound arguments.

54. The European Declaration on Digital Rights and Principles states that all digital players benefiting from the digital transformation should contribute in a fair and proportionate manner to the costs of public goods, services and infrastructures to the benefit of all people living in the EU. Some stakeholders have suggested a mandatory mechanism of direct payments from CAPs/LTGs to contribute to finance network deployment. Do you support such suggestion and if so why? If no, why not? [Only one option can be selected]

- (●) No
- ( ) Yes
- ( ) I do not know

Please explain your answer

1000 character(s) maximum

No. The statement in the European Declaration on Digital Rights and Principles puts investments in infrastructure on the same footing as investments in services (content and applications). This statement therefore favors in no way network investments over investments in content or applications. Both types of investments are highly important in the light of the digital transformation. This statement justifies or endorses in no way a transfer from players that mainly invest in content and applications to players that do invest in infrastructure.

See for the Oxera report commissioned by our Ministry re the negative impact of direct payments: https://www.government.nl/ministries/ministry-of-economic-affairs-and-climate-policy/documents/reports/2023/02/27/proposals-for-a-levy-on-online-content-application-providers-to-fund-network-operators.

We don't understand why respondents critical on this controversial policy direction have been excluded from answering Q55-Q57.

58. Do you see any possible risks of a contribution to finance network deployment in the form of direct payments and if so, which? Please substantiate your answer, including with data.

Use drag&drop or the up/down buttons to change the order or accept the initial order.

- ⠿ Negative effects on the incentives for innovation
- ⠿ Sustainability within the internet ecosystem
- ⠿ Negative consequences for consumers
- ⠿ Negative consequences on medium/small traffic generators
- ⠿ Negative consequences on the competition between large and small providers of ECNs

Other

I do not know

Please specify “Other”

100 character(s) maximum

Please explain your answer

1000 character(s) maximum

However, based on objective economic analysis it’s clear that there’s a considerable negative impact to be expected on European end-users, both businesses and consumers (although negative impact on European businesses is again not highlighted as a possible option to choose from). We refer to the Oxera report for the full assessment of the positive and negative impacts.
We note that this question regarding the negative impacts of a network fee explicitly asks to substantiate the response with data, whereas the previous questions - on the positive impacts - did not require such. This could come across as a bias in the consultation.
We also don’t understand why negative impact on larger CAP’s is not included as one of the options to choose from. It seems to us it’s important to get a full picture of the impact in order to be able to make informed decisions.

59. What mitigating measures could be put in place to avoid the risks indicated in Q58? [Multiple answers are possible]

- [ ] Excluding medium/small traffic generators
- [ ] Mandatory ratio into green (lower energy consumption) investment
- [ ] Other
- [ ] I do not know

Please explain your answer

1000 character(s) maximum

There are no mitigating measures possible as any manifestation of a network fee will harm end-users, innovation and investment in the broader ecosystem. We refer to the Oxera report.

60. The European Declaration on Digital Rights and Principles states that all digital players benefiting from the digital transformation should contribute in a fair and proportionate manner to the costs of public goods, services and infrastructures to the benefit of all people living in the EU. To achieve this, some stakeholders have suggested to introduce a mechanism consisting of a EU/national digital contribution or fund. Do you support such suggestion and if so why? If not, why not? [Only one option can be selected]

No

Yes

I do not know

Please explain your answer

1000 character(s) maximum

No. First of all, the statement from the Declaration puts infrastructure costs at equal footing as costs of services (content and applications), see above. A priori, we don't consider it appropriate to use this statement to suggest that providers of content and applications should contribute to infrastructure cost, as we also don't find it appropriate that telecom providers would need to contribute to the costs of content and application providers.

We would have welcomed it if this consultation would have focused instead on exploring potential problems and appropriate instruments to address these, rather than using the consultation to reflect on interpretations of certain stakeholders regarding the Declaration.

We note that Q62 is asking proponents for reasons to justify a preconceived solution ("a solution in search of a problem"). Such an approach is incompatible with basic principles of good policy procedures and in contradiction to the better regulation principles.

You may upload a written contribution that you think is relevant to better explain your views (max. 10 pages). Please, mark those contribution as "Confidential", which you do not wish to be published.

Please upload your file.

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/NL_Paper_accompanying_exploratory_consultation_FINAL_VERSION.pdf

Confidentiality

* The Commission will publish all contributions to this exploratory consultation. Your contribution will be published as submitted. If you consider that your replies to certain questions of the questionnaire are confidential, please mark those questions as confidential here. Responses to questions marked as confidential will not be published.

Question 1

Question 2

Question 3

Question 4

Question 5

Question 6

Question 7

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- Question 9
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- [ ] Question 60
- [ ] Question 61
- [ ] Question 62
- [x] None

Background Documents

Protection of your personal data

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