

Draft Questionnaire

How do you see the future of the connectivity sector?

Four sections:

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

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. Moreover, it is to be recalled that environmentally, information and communications technologies are an important enabler of emission reductions of 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, already in 2020, updated rules on cybersecurity of network and information systems. The NIS 2 Directive entered into force in January 2023. In light of this, additional needs and increased cost for strengthening the cybersecurity, and the resilience and redundancy of networks might be triggered.

Network virtualisation and cloudification is expected to also 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 platform 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 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.

Questions:

1. Which technological developments do you expect to impact most the electronic communications sector in the next 10-20 years? (name up to five, check the box) [scaling/prioritisation of 1-5 for all points to be foreseen in EU Survey]
 - 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
 - Other, please specify
 - Please explain your choice (Answer [max ... lines/characters])
2. From a global/strategic perspective, which challenges and opportunities will these technological advances entail for the electronic communications sector?
 - Answer [max ... lines/characters]
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)
 - Answer [max ... lines/characters]
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)
 - Answer [max ... lines/characters]
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)
 - Answer [max ... lines/characters]

6. What are your projections (if possible quantitatively) 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)?
- Answer [max ... lines/characters]
7. How are electronic communication networks likely to evolve/transform in the next 10-20 years and how will this evolution affect your business?
- Answer [max ... lines/characters]
8. What are in your view the key future market developments that are likely to significantly impact the electronic communication networks, their architecture and/or their function? Check box (max three) and explain why or how.[scaling/prioritisation of 1-5 for all points to be foreseen in EU Survey]
- 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
 - Answer [max ... lines/characters]
9. Are there major obstacles to establish standards in relation to network access protocols and APIs in order to support new service models and/or new network architectures?
- No
 - Yes
 - Explain your answer [max ... lines/characters]
10. What are additional needs for strengthening cybersecurity / network resilience and related expected cost (e.g. in terms of CAPEX) for the next five years?
- Answer [max ... lines/characters]
11. Digitalisation is an important enabler of greening. 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 will increase the environmental footprint of electronic communications. In your view, what will be the overall impact on environment?
- significantly positive
 - moderately positive
 - neutral
 - negative
 - significantly negative
 - do not know
 - Please substantiate your view, as much as possible, based on concrete figures and/or measurements.
 - Answer [max ... lines/characters]
12. What are the strengths, weaknesses, opportunities, and threats (SWOT) for the

business of providers of electronic communications that shape their current and future operations?

- Answer [max ... lines/characters]

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? (Check box, multiple answers possible, provide the order of priority) [scaling/prioritisation of 1-5 for all points to be foreseen in EU Survey]

- 1. By delaying / asset reorganisation
 - 2. by entering new segments across the internet value chain
 - 3. by entering into cooperation/partnerships with actors from other segments of the internet value chain
 - 4. by network sharing
 - 5. by implementing innovative changes to the networks architecture or function
 - 6. No structural change required
 - 7. Other
- Please explain your answer [max ... lines/characters]

14. What would be the highest barriers to achieve the needed transformations (Check box, multiple answers possible, provide the order of priority) [scaling/prioritisation of 1-5 for all points to be foreseen in EU Survey]

- 1. Legal /administrative
 - 2. Economic
 - 3. Technological
 - 4. Lack of R&D
 - 5. Other
- Please explain your answer, in particular specifying how significant the barrier would be in your view (quantify where possible) [max ... lines/characters]

15. What would be the expected yearly investment required to achieve the needed transformation of your company over the next five years? (in €)

- 1. 0-1 million
 - 2. 1-10 millions
 - 3. 10-50 millions
 - 4. More than 50 millions
- Please explain your answer, in particular including the expected sources of the investment/funding) [max ... lines/characters]

16. In which areas do you think investments will be most required to achieve the needed transformation? Please quantify, where possible, the investment in each area (Check box) (multiple answers possible, provide the order of priority) [scaling/prioritisation of 1-5 for all points to be foreseen in EU Survey]

- 1. Connectivity infrastructure
 - 2. edge cloud
 - 3. cybersecurity
 - 4. network management
 - 5. other
- Please provide your figures in million Euros and explain your answer [max ...lines/characters]

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

- Answer [max ... lines/characters]

18. Which cooperation models would you expect to see emerge or growing the most in the next 10-20 years? (check box) (multiple answers possible)[scaling/prioritisation of 1-5 for all points to be foreseen in EU Survey]

- 1. network sharing
- 2. co-investment
- 3. cooperation with towercos
- 4. cooperation with vertical industries
- 5. cooperation with online players
- 6. cooperation with neutral hosts
- 7. mergers & acquisitions
- 8. other
- Please explain your answer, including why you expect a given cooperation model to develop and expand and explain what would be the challenges of these cooperation models? [max ... lines/characters]

19. 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.

- No
- Yes
- Explain your answer [max ... lines/characters]

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, 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 (VHCN) 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.

In relation to **affordability**, on the EU level, in 2021 retail prices of fixed and mobile broadband offers became cheaper than previous year among all household baskets (see the study “Mobile and Fixed Broadband Prices in Europe 2021”) in each usage/speed category. The price decreases varied between different baskets from around 6,4 per cent to over 13 per cent.

The availability and affordability of broadband to European consumers benefits a wide range of players, including providers of online content, applications and services that 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.

Questions:

20. In your opinion and considering the overall economic context, is the access at an affordable price to (basic/high speed/Gigabit speed) broadband to consumers likely to evolve in the next 10 years? Please substantiate your answer with data as much as possible.

likely to increase likely to remain the same likely to decrease do not know

- A Basic broadband
- B High speed broadband
- C Gigabit speed broadband
- Please explain your answer [max ... lines/characters]

21. In your view, has the universal service regime been an efficient and effective tool in protecting consumers with low income or special social needs?

- Significantly
- moderately
- little
- not at all
- do not know
- Please explain your answer [max ... lines/characters]

22. In your view, does the universal service regime answer the future connectivity needs that should be ensured to all consumers?

- No
- Yes
- Do not know
- Please explain your responses. In case of negative reply or replies, please indicate in your view what are the possible shortcomings of the universal service regime.
- Answer [max ... lines/characters]

23. In your view, what do the expected market and technological developments described in Section 1 mean for the universal service regime?

- 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 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)
- Answer [max ... lines/characters]

24. 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?

- 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 (namely those that generate most traffic)
- other ways of financing
- Please explain your answer [max ... lines/characters]

25. If you answered in the previous question that the range of providers should be widened, how should contributions to financing from private entities (i.e. providers of electronic communications, digital online players and/or data generators) to the universal service regime be structured?

- all should contribute equally
- contribution should be in proportion to certain criteria
- other
- Please explain your answer [max ... lines/characters] If you consider that contribution should depend on certain criteria, please indicate the relevant criteria.

26. Outside universal service, could other means of support to consumers to ensure their affordable access to broadband be envisaged?

- No
- Yes
- No opinion
- Please explain your answer [max ... lines/characters] and if yes, explain which other means.

27. Would a dedicated EU-wide fund be useful?

- a. Yes, it would be useful:
 - for support to ensure that consumers have affordable access to broadband in general
 - for support to ensure that consumers have affordable access to broadband only in specific crisis circumstances to address acute but temporary difficulties
 - for network deployment, especially in rural areas
- b. No it would not be useful
- Please explain your answer [max ... lines/characters] and whether a distinction should be made between all consumers and those with low income or special social needs.

28. If you answered that a fund would be useful, who should contribute to the dedicated EU-wide fund? (multiple answers are possible)

- public general budget
- providers of electronic communications networks and services
- online players or data generators that benefit from connectivity
- other ways of financing
- Please specify which and explain your answer [max ... lines/characters]

29. From an affordability perspective, what is your view regarding the retail price cap on intra-EU communications (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 (OIR) 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 and substantiate where appropriate [max ...lines/characters]

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 and the Commission and the NRAs need to further adjust their intervention. 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, 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 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 may have detrimental effects on the financial sustainability of telecoms operators.

In addition, radio spectrum policy is a key element to boost EU competitiveness and innovation. The question emerges to what extent the potential development of a more coherent radio spectrum market in the EU as opposed to the current fragmentation of national radio spectrum management practices (including e.g. concerning satellite communications and vertical use cases), can lead to more favorable investment conditions. Furthermore, in the context of challenging geopolitical climate, the question arises whether it is necessary to upgrade the existing spectrum governance framework so as to strengthen the EU strategic autonomy and reduce precarious dependencies.

Questions:

30. 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?
- Answer [max ... lines/characters]
31. What are in your view the obstacles to the full integration of the single market for electronic communications (e.g. in terms of the rules governing the general authorization, 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 do not identify such obstacles, what in your view would be the reasons why providers of ECNs generally do not offer their services EU-wide?
- Answer [max ... lines/characters]
32. What cost savings or other efficiencies could you identify/expect in the deployment of infrastructure and provision of services by providers of ECNs, in case such services were to be offered EU-wide? 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.) and quantify them if possible.
- Answer [max ... lines/characters]
33. Do you see any obstacles to cross-border consolidation of electronic communications providers in the EU? If so, 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?
- Answer [max ... lines/characters]
34. In your view, what could be the benefits (to the extent possible quantitatively) resulting from a (more) integrated radio spectrum market in the EU? What could be steps/actions that should be taken to promote such a scenario?

- Answer [max ... lines/characters]

35. Should a common EU-level licensing/authorisation scheme for spectrum use be implemented 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), for instance in cases of satellite communications and/or vertical use cases?

- Answer [max ... lines/characters]

36. To what extent 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 within the European Conference of Postal and Telecommunications Administrations (CEPT)) as a potential issue of concern for EU sovereignty, resilience or security? Do you think that there should be a specific structural EU forum 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?

- Answer [max ... lines/characters]

37. Should the radio frequency interference cases to EU Member States from third countries (notably those that may potentially have serious effects to more than one Member State) be treated only at EU level (whereby the EU acts in unity, instead of each affected Member State acting individually)?

- Answer [max ... lines/characters]

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. 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, 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 (EU) 2015/2120.

Questions:

38. [Primarily for providers of ECNs, however in order to be able to see different perspectives we welcome replies from all types of respondents] 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 Q40.

- Provide the threshold propose and substantiate it [max ... lines/characters]

39. [Primarily for providers of ECNs and LTGs, however in order to be able to see different perspectives we welcome replies from all types of respondents] 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 (you may upload an excel file)

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)

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

<Only allow numeric value>

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

- 0-5%
- 6-10%
- 11-15%
- 16-20%
- ...until 46-60%

- Explain your answers [max ... lines/characters]

40. [Primarily for providers of ECNs and LTGs, however in order to be able to see different perspectives we welcome replies from all types of respondents] 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 (you may upload an excel file).

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)

2022 and 2023 Planned future total direct investment in network infrastructure in million EUR within or relevant for the EU Member States

[Only allow numeric value]

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

- 0-5%
- 6-10%
- 11-15%
- 16-20%
- ...until 46-60%
- Explain your answer and upload proof of data justifying it (e.g. official presentations to financial investors, board of directors, etc) [max...lines/characters]

41. [Primarily for providers of ECNs, however in order to be able to see different perspectives we welcome replies from all types of respondents] What is today the share of your network investment incremental costs caused by the increases of data traffic coming from so-called large traffic generators (“LTGs”), you defined in Q38? 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%			

Explain your answer, providing a separate assessment for fixed and mobile network [max ... lines/characters]

42. [Primarily for providers of ECNs, however in order to be able to see different perspectives we welcome replies from all types of respondents:] 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 five years.

For fixed network investment costs:

- 0 - 20%
- 21 - 40%
- 41 - 60%
- 61 - 80%
- Over 81%

For mobile network investment costs:

- 0 - 20%
- 21 - 40%
- 41 - 60%
- 61 - 80%
- Over 81%

Explain your answer, providing a separate assessment for fixed and mobile network [max ... lines/characters]

43. [Primarily for providers of ECNs, however in order to be able to see different perspectives we welcome replies from all types of respondents:] 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: Textbox and % entry
- 2nd largest contributor: Textbox and % entry
- ...
- 10th largest contributor: Textbox and % entry

Explain your answer [max ... lines/characters]

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 five 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 6-10%
- Decreased 11 - 15%
- Decreased over 15%
- Other
- Explain your answer [max ... lines/characters]

45. [Primarily for providers of ECNs, however in order to be able to see different perspectives we welcome replies from all types of respondents:] In your view, over the last five 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 over 20%
- They increased up to 20%
- They did not change
- They decreased by up to 20%
- They decreased by more than 20%
- Other

● Answer [max ... lines/characters]

46. 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

● Explain your answer [max ... lines/characters]

47. [Primarily for LTGs, however in order to be able to see different perspectives we welcome replies from all types of respondents] Please specify the interconnection fees paid to providers of ECNs within EU Member States cumulatively for the last five years and provide an outlook for the next five years.

	2017 (actual)	2018 (actual)	2019 (actual)	2020 (actual)	2021 (actual)	2022 (actual)	2023 (plan)	2024 (plan)	2025 (plan)	2026 (plan)	2027 (plan)
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											

Explain and substantiate your answer (if possible indicate the data source) [max ...lines/characters]

48. [Primarily for LTGs, however in order to be able to see different perspectives we welcome replies from all types of respondents] 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

Paid peering price change:

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

Answer [max ... lines/characters]

50. Are there any obstacles preventing providers of ECNs networks from charging digital players for increased data traffic through their networks?

- No
- Yes
- I do not know
- Please explain and substantiate your answer [max ... lines/characters]. In particular, if you replied yes, please explain the reasons (e.g. legal, regulatory, other)

51. What could be the effect 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, on the environmental footprint of the services provided over the networks? Please substantiate your views.

- Answer [max ... lines/characters]

52. 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? Please substantiate your answer.

- No
- Yes
- I do not know
- Answer [max ... lines/characters]

53. In case you answered yes to Q52, who should be the:

a) main contributors, and why? Please substantiate your answer.

- digital online players/traffic generators in general (e.g. online content providers)

- certain digital online players (e.g. largest traffic generators)
- others
- Answer [max ... lines/characters]

b) beneficiaries, and why? Please substantiate your answer.

- all providers of internet access services
- all ECN providers (including wholesale-only undertakings for example)
- others
- Answer [max ... lines/characters]

54. In case you answered yes to Q52, what would be the expected benefits/advantages and for whom? (quantify, timing)

- Answer [max ... lines/characters]

55. In case you answered yes to Q52, how should a contribution mechanism be structured to ensure that it effectively contributes to a swift and broader deployment of very high capacity networks?

- Answer [max ... lines/characters]

56. Do you see any possible risks of a contribution to finance network deployment in the form of direct payments and if so, which? (Multiple answers are possible, provide order of priority). Please substantiate your answer, including with data.

- 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 (please, elaborate)
- I do not know
- Answer [max ... lines/characters]

57. What mitigating measures could be put in place to avoid the risks indicated in question 56? (Multiple answers are possible)

- Excluding medium/small traffic generators
- Mandatory ratio into green (lower energy consumption) investment
- Other (please, elaborate)
- I do not know
- Explain, elaborate your answer [max ... lines/characters]

58. 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 levy or fund. Do you support such suggestion and if so why? If not, why not? Please substantiate your answer.

- No
- Yes
- I do not know
- Answer [max ... lines/characters]

59. In case you answered yes to Q58, who should pay such EU/national digital levy or contribute to such fund?

- Answer [max ... lines/characters]

60. In case you answered yes to Q58, what should this EU/national digital levy or fund finance? (multiple answers are possible, provide order of priority)

- future network deployments
- protect most vulnerable consumers
- increased costs related to increased traffic
- other
- Please explain your answer [max ... lines/characters]