# Net Neutrality Review

## Annexes

Non-confidential version: [✂] marks confidential redactions

**Statement Annexes**

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# Contents

## Annex

# A1. Guidance on Ofcom's approach to assessing compliance with the net neutrality rules

## Introduction

### Background and purpose

A1.1 The Open Internet Access Regulation (the 'Regulation'), which came into effect on 30 April 2016, introduced rules on net neutrality.[1] The Regulation establishes rules to safeguard equal and non-discriminatory treatment of traffic in the provision of Internet Access Services and related End-users' rights. The Regulation sets out that End-users have rights to access and distribute information and content, use and provide the Applications, and use the Terminal Equipment of their choice, without discrimination, via their Internet Access Service. Following the UK's departure from the EU, the Regulation was retained in UK law with minor amendments.[2] Ofcom's role under the Regulation is to monitor and ensure compliance, as well as to promote the availability of non-discriminatory internet access.[3]

A1.2 This document sets out Ofcom's approach to assessing compliance with the Regulation. Internet Service Providers (or 'ISPs') should self-assess their offers, practices and approach against the Regulation and this guidance. The Regulation does not require ISPs to receive *ex ante* authorisations from Ofcom in relation to services, practices or approaches covered by the Regulation i.e. traffic management or zero-rating offers, differentiated retail offers or Specialised Services.

A1.3 We have reviewed the functioning of the net neutrality rules taking into account the following three overarching policy objectives, which we will continue to apply in our overall approach:

a) Safeguarding citizens' and consumers' access to an open internet, so that:

i) consumers are able to access and distribute online Applications of an appropriate quality and at reasonable prices, and to use the Terminal Equipment of their choice via an appropriate Internet Access Service;

ii) citizens are able to access and distribute the widest range of lawful information online, are unconstrained in how they can express their opinions and participate in the public debate and other democratic processes, and can access a wide range of public services; and

[1] Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access and retail charges for regulated intra-EU communications (legislation.gov.uk).

[2] See The Open Internet Access (Amendment etc.) (EU Exit) Regulations 2018 (legislation.gov.uk).

[3] For the avoidance of doubt, where we refer to the Regulation in this guidance, we are referring to the version, as amended, that applies in the UK. See Regulation (EU) 2015/2120 as amended by The Open Internet Access (Amendment etc.) (EU Exit) Regulations 2018.

iii) Content and Applications Providers are able to distribute and provide online Applications to all consumers and citizens.

b) Safeguarding the open internet as an engine of innovation, so that citizens and consumers benefit from competition through:

iv) Content and Applications Providers having strong incentives to continuously innovate; and

v) End-users having a choice of a wide range of online Applications in the long run.

c) Safeguarding well-run, efficient and robust networks, so that:

vi) providers of connectivity services are able to manage their networks in an efficient manner, ensuring the widest availability of services at the best quality of experience to consumers and citizens, with the lowest cost; and

vii) providers of connectivity services continue to invest and innovate in their networks and services, to ensure their networks are fit to meet consumer needs and to support innovation in online services, both today and in the future.

A1.4 Based on this review, we set out here updated guidance. This guidance replaces the guidance we published in 2019.[4]

A1.5 This guidance also sets out the information we may gather from time to time as part of our monitoring activities and to assess compliance with the Regulation

## Legal context

A1.6 This guidance is given under the Regulation to assist ISPs to comply with the Regulation by outlining Ofcom's likely approach to assessing compliance. In formulating this guidance, we took account of the Guidelines on the Implementation of the EU Open Internet Access Regulation (the 'Guidelines') issued by the Body of European Regulators for Electronic Communications ('BEREC'). We incorporated many aspects of the Guidelines with such modifications as we considered appropriate, so that our guidance sets out our approach to the net neutrality framework in a comprehensive way. Our objective is to ensure that this guidance is comprehensive and complete for the benefit of ISPs, although we may amend it from time to time. In each case, we will consider whether it would be necessary and appropriate to consult on proposed amendments taking into account the scale and significance of the issue(s) in question.

A1.7 In complying with the net neutrality rules, ISPs must take account of the following:

a) the Regulation;[5]

b) the regulatory obligations contained in the following General Conditions (together the 'Relevant General Conditions'):

i) General Conditions C1.3, C1.4 and C1.7, which implement (among other things) the Regulation by specifying detailed transparency requirements in respect of the information which must be provided to consumers; and

[4] Ofcom, 2019. *Ofcom's approach to assessing compliance with net neutrality rules – Frameworks for assessing zero rating offers and traffic management measures for compliance with the Open Internet Regulation*.

[5] This includes (among other things) the obligation to comply with all relevant data protection legislation in case of any traffic management measure which entails processing of personal data.

ii) General Condition C5.12, which sets out certain obligations in respect of emergency communications.

A1.8 They should also consider this guidance alongside any other guidance which may be given under the Relevant General Conditions.

A1.9 This guidance is not binding on Ofcom, and while we will take it into account alongside our enforcement guidelines[6] when determining whether to take enforcement action, we will determine compliance with the Regulation and the Relevant General Conditions on the basis of the individual circumstances of any given case. However, where we decide to depart from the guidance, we expect to give reasons for doing so.

# Definitions

A1.10 This section sets out terms which are relevant to this guidance. Words and expressions used in the Regulation, the Communications Act 2003 and the Relevant General Conditions shall have the same meaning when used in this guidance, unless otherwise indicated.[7]

A1.11 For the purpose of interpreting this guidance:

a) headings and titles shall be disregarded;
b) expressions cognate with those referred to in this guidance shall be construed accordingly; and
c) the Interpretation Act 1978 shall apply as if this guidance were an Act of Parliament.

A1.12 Commonly used terms in this guidance are set out below for ease of reference:

a) '**Application'** is used to mean any of the following terms used in the Regulation: 'applications and services' and 'content, application and service';
b) **'Application-agnostic'** means that the commercial and technical treatment of traffic is independent of the Application;
c) **'Content and Application Providers' or 'CAPs'** means providers who make content (e.g. web pages, blogs, video) and/or Applications (e.g. search engines, VoIP Applications) and/or services available on the internet.[8] CAPs may also make Applications available via Specialised Services. CAPs are protected as End-users under the Regulation in so far as CAPs use an Internet Access Service to reach other End-users;
d) '**End-user**', in relation to a Publicly Available Electronic Communications Service, means: (i) a person who, otherwise than as a communications provider, is a customer of the provider of that service; (ii) a person who makes use of the service otherwise than as a communications provider; or (iii) a person who may be authorised, by a person falling within (i), so to make use of the service;[9]
e) '**Interconnection**' means the linking (whether directly or indirectly by physical or logical means, or by a combination of physical and logical means) of one ISP, CAP, other operator or electronic communications network to another for the purpose of enabling

[6] We published revised enforcement guidelines last year: Ofcom, December 2022. *Regulatory Enforcement Guidelines (ofcom.org.uk)*.
[7] In some instances, we have simplified the wording used in the Communications Act or General Conditions or excluded elements of the definition which are irrelevant for the purposes of this guidance.
[8] i.e. the global system of interconnected networks which forms the internet.
[9] A person falling within this definition may be a natural or legal person using or requesting a Publicly Available Electronic Communications Service. 'End-user' may therefore encompass individuals and businesses, including CAPs.

the persons to be able: to communicate with users of the other; or to make use of Applications provided by means of the other (whether by the provider of that network or by another person). This may include transit, private or public peering including connection to content distribution networks (CDNs) and internet exchange points (IXPs);

f) '**Internet Access Service' or 'IAS'** means a Publicly Available Electronic Communications Service that provides access to the internet, and thereby connectivity to virtually all end points of the internet,[10] irrespective of the network technology and Terminal Equipment used;

g) **'Internet Service Providers' or 'ISPs**' means providers of Internet Access Services. ISPs may also be providers of Specialised Services or other Publicly or non-publicly Available Electronic Communications Services;

h) '**Publicly Available Electronic Communications Services'** means services offered by communications providers that are generally available to End-users. This includes services targeted at certain End-user groups (such as those using gaming software and equipment);

i) **'Quality of Service'** or **'QoS'** refers to the technical metrics that describe the characteristics of a network service, such as latency, jitter, packet loss, throughput, service assurance, security, energy consumption and availability;

j) '**Specialised Service'** means a Publicly Available Electronic Communications Service other than an Internet Access Service which is optimised for specific Applications, where the optimisation is necessary in order to meet requirements of such Applications for a specific level of quality;

k) '**Terminal Equipment'** means either (i) equipment directly or indirectly connected to the interface of a publicly available electronic communications network to send, process or receive information, with the direct or indirect connection being made by a wire or optical fibre or electromagnetically; or (ii) equipment which is capable of being used for the transmission or reception, or both, of radio communication signals by means of satellites or other space-based system.

## Structure of this guidance

A1.13 The remainder of this guidance sets out our approach to assessing compliance on the following issues:

- the scope of the Regulation;
- safeguarding open internet access;
- zero rating;
- traffic management;
- retail offer differentiation;
- public interest exceptions;
- Terminal Equipment;

[10] Access to end-points is not restricted, other than in accordance with the legal requirements, and permitted traffic management practices in accordance with Article 3 of the Regulation. Where restrictions to reach end points stem from the use of two different internet addressing schemes, IPv4 and IPv6, this typically does not mean the services cannot be defined as an Internet Access Service. While it is not possible to connect two different points with different types of addresses without any translation function, Ofcom considers that the term "virtually all end points" should, at present, not be interpreted as a requirement on ISPs to offer connectivity with both IPv4 and IPv6.

- Specialised Services;
- transparency; and
- monitoring, reporting and compliance.

# Scope of the Regulation

## Services which are not publicly available fall outside the scope of the Regulation

A1.14 The Regulation applies to Internet Access Services and Specialised Services that are Publicly Available Electronic Communications Services. Services that are offered only to pre-determined, closed End-user groups, so that access is limited to specific End-users i.e. particular institutions, corporate networks or individuals, even at multiple locations, would not normally be considered publicly available, and thus fall outside the scope of the Regulation.

A1.15 Networks used to provide services exclusively within the site(s) of an individual End-user (for example a business) are unlikely to be considered publicly available. This would be the case, for example, for:

- corporate private networks;
- machine-to-machine networks in factories, ports, etc.; or
- networks within campuses (for example, hospitals and academic institutions).

## Internet Access Services offered on transport services

A1.16 Internet Access Services provided on transport services available to the general public (including in the form of Wi-Fi hotspots limited to customers of the enterprise providing the Internet Access Service) are likely to constitute Publicly Available Electronic Communications Services and, as such, are in scope of the Regulation.

## Internet Access Services offered in public spaces

A1.17 Internet Access Services provided in venues such as cafés, restaurants, shopping centres and hotels open to the general public (including in the form of Wi-Fi hotspots limited to customers of the enterprise providing the Internet Access Service) are likely to constitute Publicly Available Electronic Communications Services and, as such, are in scope of the Regulation.

## Virtual private networks

A1.18 A Virtual Private Network (VPN) is an electronic communications service which provides private network functionality over a public network. Where such services are generally available to End-users or a sub-set of End-users, they are likely to be Publicly Available Electronic Communications Services and therefore within the scope of the Regulation as discussed above. For example, corporate VPN services may be available to businesses or a subset of businesses such as large enterprises.

A1.19 A publicly available VPN may be accessed using an Internet Access Service (e.g. using an encrypted traffic stream) or where there are quality requirements not supported by the Internet Access Service, a Specialised Service may be used. Where an Internet Access Service

is used, the encrypted VPN traffic is subject to the equal treatment of traffic requirements applicable to traffic generated by that Internet Access Service.

A1.20 VPNs often provide egress to the internet, typically in conjunction with other services. For example, a corporate VPN may provide employees of a business with access to the internet in addition to corporate network functionality, enabling them to access enterprise software and data. In the case of publicly available VPNs, such egress is considered to be an Internet Access Service within the scope of the Regulation.

A1.21 See paragraph A1.114 - A1.115 for our guidance about content filters provided as part of an Internet Access Service e.g. parental controls or similar services used by employers to restrict their employees access to the internet.

# Safeguarding open internet access

## Equal treatment of traffic

A1.22 The Regulation sets out the core principle of net neutrality, that ISPs shall treat all traffic equally when providing Internet Access Services, without discrimination, restriction or interference, and irrespective of the sender and receiver, the content being accessed, or the services or equipment used.

A1.23 Equal treatment does not necessarily imply that all End-users will experience the same network performance or Quality of Service. Thus, even though packets can experience varying transmission performance, they can normally be considered to be treated equally as long as all packets conveyed under an individual Internet Access Service are processed agnostically to: (i) the Application accessed, used, provided and/or distributed; and (ii) the Terminal Equipment used (as discussed further below).

A1.24 Agreements and practices that involve technical discrimination would constitute unequal treatment, which would be likely to breach Article 3(3), unless the criteria for exceptions under the second and third subparagraphs of Article 3(3) are met (see the traffic management section below for further information). This holds in particular for practices where an ISP blocks, slows down, restricts, interferes with, degrades or discriminates access to specific content, one or more Applications (or categories thereof), except when justified by reference to the exceptions relating to traffic management set out in the third subparagraph of Article 3(3).

## Agreements between End-users and ISPs for Internet Access Services

A1.25 ISPs may reach agreements with End-users as to the commercial, technical, or other characteristics of the Internet Access Service, but they must not limit End-users' rights and thus circumvent provisions of the Regulation safeguarding open internet access. ISPs may engage in traffic management measures, under certain defined conditions, as set out in the Regulation and this guidance.

A1.26 In this context, agreements between two parties may also have an impact on third parties. For example, ISPs are required to deliver content to End-users with whom they have agreements, irrespective of whether the ISP also has an agreement with the relevant CAP. ISPs may also make agreements with CAPs (for example to directly connect their networks or

to host a particular CAP's content within the ISP network), but as this is not required by the Regulation, ISPs must not discriminate in favour of any CAPs with whom they have agreements.

A1.27 Examples of commercial practices which would likely be compatible with the Regulation include:

a) Various retail packages which are Application-agnostic but offer different levels of Quality of Service, data allowances, contractual length, bundles, or with or without subsidised equipment.[11] We discuss this further at paragraphs A1.107 – A1.108;
b) Application-agnostic offers where data consumption during a particular time period (e.g. during the weekend or off-peak times or a given number of hours per month) is not counted against the general data cap in place on the tariff for that Internet Access Service or is priced differently. We discuss this further at paragraphs A1.107 – A1.108;
c) Application-agnostic tariff plans for a broad public (e.g. all End-users) or a targeted group of End-users (e.g. special tariffs for younger people, school children, students, seniors or low-income citizens); and / or
d) Offers which incorporate a 'fair usage' policy. We discuss this further at paragraph A1.124.

## End-user imposed restrictions and traffic management

A1.28 Articles 3(1), 3(2) and 3(3) do not preclude End-users from taking actions to block or restrict access to certain content or other End-users, or from taking action to manage specific content, for example through the use of client software Application-based restrictions or end-point based congestion controls (such as Transmission Control Protocol (TCP) congestion control).

A1.29 ISPs may offer features within the Internet Access Service that support the functionality of end-point based services or provide similar capabilities to end-point based services, as long as the End-user is in control of whether or not the service is used, and the service in question is provided with information to understand the content that is affected and the effect of applying the control. Such service, where provided as part of the contract for an Internet Access Service, would be subject to Articles 3(1) to 3(3) in that it must not limit the End-users' rights to access any content of their choice, but can give End-users the ability to make choices about the treatment of traffic. For example:

- The default Domain Name System (DNS) resolvers provided by the ISP are considered to be part of the Internet Access Service since without a DNS resolver the Internet Access Service would be practically unusable for the End-user. On the other hand, additional DNS resolvers and Hypertext Transfer Protocol (HTTP) proxy servers used by the End-user are examples of end-point based services, since the Internet Access Service provided by the ISP operates without the need for these.
- Any functions provided in the modem and the access router, where these are required to provide the Internet Access Service, are considered a part of the Internet Access Service. Functions that are controlled by the End-user are considered to be end-point based services as above. Quality of Service functionality provided by a router supplied by an ISP is an example of an end-point

[11] In this context and more generally, the status of an Internet Access Service as Application-agnostic would not be affected by the application of permitted traffic management measures.

based service falling outside the scope of the Regulation provided that the functionality is controlled by the End-user.[12]

### Sub-internet offers

A1.30 Services that provide restricted access to the internet (e.g. by restricting access to certain Applications, or that allow access to a limited part of the internet) are sometimes referred to as 'sub-internet offers'. Such services are likely to be contrary to the requirements set out in Articles 3(1), 3(2) and 3(3).

A1.31 Certain end-points accessible by an Internet Access Service may be limited because of the nature of the Terminal Equipment used to access the service (e.g. services designed for communication with individual devices, such as e-book readers or machine-to-machine devices such as smart meters etc.). Such services would not be contrary to the requirements set out in Articles 3(1), 3(2) and 3(3) unless designed to circumvent those requirements.

### Interconnection

A1.32 Some CAPs and other market participants may operate their own networks and have Interconnection agreements with ISPs or other parties, including relating to the use of CDNs embedded within ISP networks. The provision of Interconnection is a distinct service from the provision of Internet Access Services. Interconnection practices are thus excluded from obligations relating to equal treatment of all traffic when providing an Internet Access Service. However, Ofcom may take into account the Interconnection policies and practices of ISPs in so far as they have the effect of limiting the exercise of End-user rights under Article 3(1) or if the Interconnection is implemented in a way which seeks to circumvent the Regulation.

## Zero-rating

A1.33 Zero-rating is a commercial practice offered by ISPs whereby a customer can access particular content or a class of content without it counting towards their general data allowance. [13] The Regulation provides that Ofcom, as the relevant enforcement authority, is empowered to intervene against agreements or commercial practices which lead to End-user choice being materially reduced.[14]

A1.34 In assessing zero-rating offers, we are only likely to have concerns in limited circumstances. We define three types of zero-rating offers for the purposes of this guidance, to provide clarity on when offers will be subject to greater scrutiny:

i) **'Type One' zero-rating offers** are those where ISPs zero-rate access to information and services from public sector bodies (e.g. Government, NHS), charities or non-governmental organisations (NGOs) that provide social benefit to the public and are not in competition with other suppliers. This type of offer typically has no prospect of harming consumer choice and gives End-users favourable access to socially

[12] Such functionality might for example allow an End-user to define multiple quality levels and assign Terminal Equipment and/or Applications to them.
[13] A class is a grouping of CAPs who provide similar content, such as video streaming content, audio streaming content or social media.
[14] Our approach to monitoring, reporting and ensuring compliance for zero-rating offers is set out below (see paragraphs A1.185 – A1.187).

beneficial information and services. Therefore, once we are satisfied that an offer is a Type One zero-rating offer, we are unlikely to consider it any further.

ii) **'Type Two' zero-rating offers** are offers that are genuinely open to all CAPs of a particular class. They are unlikely to reduce the choice of CAPs available to End-users, as any equivalent CAPs will be able to join should they so wish. Therefore, once we are satisfied that an offer is a Type Two zero-rating offer, we are unlikely to consider it any further.

iii) **'Type Three' zero-rating offers** are all other offers that do not meet the Type One or Type Two criteria. We will continue to monitor and review such offers, where appropriate, on a case-by-case basis, taking into account a range of factors to determine if they are likely to raise concerns to warrant opening a formal investigation.

## Type One offers

A1.35 A zero-rating offer will be classified as Type One if it has all of the following features:

a) **Socially beneficial**: the information or services that are being zero-rated clearly provide social benefit to citizens and consumers as well as benefitting society at large. This could include, for example, information relating to public health, financial support or support for vulnerable individuals.

b) **Provided by a public sector organisation, charity or NGO**: the information or services being zero-rated are provided by a public sector body, charity or NGO which is not operating in a commercial, profit-making capacity. This would include the Government, local authorities, government agencies, the UK Parliament and devolved parliaments,[15] as well as charities, non-government organisations and not-for-profits.

c) **Absence of competition**: there is no competing supplier that provides a comparable alternative to the information or services being zero-rated.

A1.36 In addition, all Type One offers must be transparent to End-users, as explained in paragraph A1.162.

A1.37 Where we are satisfied that an offer is a Type One offer, we are unlikely to consider it further, in the absence of any complaints or concerns being raised with us.

## Type Two offers

A1.38 A zero-rating offer will be considered genuinely open, and will therefore be classified as Type Two, if it has all of the following features:

a) **Class-based**: the zero-rating offer is open to CAPs of a particular class, as opposed to a single CAP or a limited number of CAPs. A class is a grouping of CAPs who provide similar content, such as video streaming content, audio streaming content or social media. Classes should be defined in a way that is easily understood by customers and gives them a meaningful choice of different service providers, rather than based on technical specifications of the traffic.

b) **Absence of undue requirements to join**: CAPs of the same class should be able to apply to join the offer without any undue requirements (e.g. financial, legal, technical, or

[15] The UK departments, agencies and public bodies set out on this website are likely to fall under this criterion. UK Government website, Departments, agencies and public bodies [accessed 16 October 2023].

other).[16] To meet this requirement, ISPs should not request payment from CAPs to join, as this may deter some CAPs.

c) **Non-discriminatory treatment**: all CAPs included, or seeking to be included, in the zero-rating offer should be treated in a non-discriminatory way, including any CAPs owned by the ISP.

d) **Transparency for CAPs and timely responses by ISPs**: the process for a CAP to join the offer should be clear and publicly available (i.e. on the ISP's website). This should include an accurate description of the process for joining and relevant contact details. We would also expect a timely response to any request by a CAP to join an offer.

A1.39 In addition, Type Two offers must be transparent to End-users, as explained in paragraph A1.162.

A1.40 Where an offer has all of these features, it is unlikely to raise any material concerns. Once we are satisfied that an offer is a Type Two offer, we are unlikely to consider it further, in the absence of any complaints or concerns being raised with us.

## Type Three offers

A1.41 Zero-rating offers that do not meet the Type One or Type Two criteria will be classified as Type Three offers. Our approach to assessing Type Three offers focuses on identifying offers that are likely to undermine CAPs' ability to compete effectively and in turn could materially reduce consumer choice of CAPs and services in the long-term.

A1.42 We outline below a list of factors that will help us assess whether a zero-rating offer is likely to have a material impact on consumer choice. For those offers that are likely to have a material impact on consumer choice, we will also consider factors that will help us assess whether the impact is likely to be positive or negative for consumers and citizens.

A1.43 When assessing Type Three offers, we will consider all relevant factors in the round. Some factors on their own may appear to be problematic, but this does not mean the offer will automatically be found to be in breach of the Regulation, where the assessment indicates that End-user's rights have not been materially reduced overall. Not all factors will be relevant or required to be evaluated for all offers, and additional factors may need to be considered depending on the facts of the case. All Type Three offers must be transparent to End-users, as explained in paragraph A1.162.

### Factors relevant for assessing whether consumer choice is impacted

A1.44 Whether relevant CAPs are effectively excluded from the zero-rating offer – we may consider the extent to which a zero-rating offer excludes a relevant CAP and undermines its ability to compete by assessing:

- **Openness of a zero-rating offer**: the easier it is for CAPs to join, the less likely it will undermine the ability of CAPs to compete effectively. Even if an offer does not meet all the Type Two criteria, those criteria would still be relevant when assessing the degree of openness of a Type Three offer and whether it may undermine certain CAPs' ability to compete.

A1.45 Whether it is important for a CAP to be zero-rated in order to compete effectively – even if a CAP is excluded from a zero-rating offer, if only a small number of End-users actually make

[16] No "undue" requirements means that all requirements placed on CAPs to join the offer must be necessary in order for the zero-rating offer to function, and they must be technically possible.

use of the offer, the overall impact of the offer may be insufficient to materially affect non-zero-rated CAPs' ability to compete. However, if zero-rated access to a certain class of content was pervasive among End-users, and contingent on the other factors in our Type Three framework, a CAP of the same class may find it difficult to compete effectively if it is not zero-rated. Therefore, we may consider:

- **Scale of take-up**: the higher the overall take-up of a zero-rating offer by customers, the higher its potential impact on competition between CAPs. The take-up could be measured by the number or proportion of UK customers who have access to the zero-rated content being assessed.[17]
- **Duration of the offer**: when zero-rated access to content is only provided for a short duration (e.g. a limited trial period) the offer is less likely to have an impact on how CAPs compete, especially in the long-term. However, there may be a larger impact if End-users have zero-rated access to a CAP for a sustained or indefinite period of time.

A1.46 Whether the offer is likely to influence consumer behaviour – even if relevant CAPs were excluded from a zero-rating offer and zero-rated access was pervasive among End-users, a CAP's ability to compete would not be materially affected if consumer behaviour is unlikely to be influenced by the offer. We expect that End-users are most likely to be influenced by an offer when they are cautious about their data usage, and therefore seek to minimise deductions to their data allowance by using zero-rated CAPs. We may consider the following factors:

- **Data scarcity**: we may consider the take-up of contracts with unlimited data allowance and for those customers with limited data, how much unused data they have each month. The latter will be driven both by their monthly data allowance and the amount of data that they typically use. The larger their data allowance and the less data they normally use (and so the less scarce data will be for them), the less likely it is that an offer would influence their choice of CAPs.
- **Data usage of zero-rated content**: the heavier the data usage associated with zero-rated content, the more likely it is that End-users will prefer to use zero-rated content as opposed to non-zero-rated CAPs' content, in order to preserve their data allowance. As part of this, it will also be relevant to consider if accessing the content is highly reliant on mobile data (as opposed to Wi-Fi internet access where the connectivity is likely to have a higher, or unlimited, data allowance), as the zero-rating of such content is more likely to influence End-users' choice of which CAP to use.[18]
- **Other relevant features of an offer**: other factors could compound the effect that a zero-rating offer may have on consumer behaviour. For example, if an ISP provides free or discounted access to content (which normally requires a subscription fee) in addition to zero-rating the content, the potential for the offer to influence consumer behaviour will increase.

[17] We recognise that take-up could be high due to either many customers of a single large ISP having zero-rated access, or customers of several different ISPs having zero-rated access.
[18] For example, ride-hailing services (e.g. Uber, Bolt) are more likely to be dependent on using mobile data (as opposed to Wi-Fi data) as consumers are likely to be outside the home when using such content.

## Other factors relevant to assessing the impact

A1.47 Market power and market dynamics[19] – the market position of ISPs or CAPs (i.e. their size, capabilities and relative constraints from their competitors) may potentially give them a degree of market power over End-users. We are likely to be more concerned about zero-rating offers where the CAP or ISP has market power, as they may be able to use the zero-rating offer to entrench that market position. We may therefore consider:

- **Market position of the zero-rated CAP**: CAPs with a strong market position, if part of a zero-rating offer, are more likely to have the ability and incentive to use zero-rating offers to stifle competition and undermine smaller CAPs in order to preserve their strong existing position. In contrast, where the offer relates to a smaller, challenger CAP competing against a rival with a strong established position, it is more likely to have a pro-competitive impact.
- **Market position of the zero-rating ISP**: an ISP with a strong market position, if it uses a zero-rating offer to give preferential treatment to a narrow selection of CAPs, is more likely to have a large impact on competition among the relevant CAPs, given the number of subscribers of this ISP.
- **Vertical Integration**: a vertically-integrated ISP-CAP with a strong market position can have a greater incentive and ability to create a zero-rating offer that could give itself an advantage by giving preferential treatment to its own services that are in competition with the services provided by other rival CAPs.
- **Characteristics of the CAP market**: zero-rating offers could compound or reduce the barriers to entry or expansion in certain CAP markets, depending on whether they apply to incumbents or smaller firms or new entrants.

A1.48 Other benefits to citizens and consumers – we may take into account other policy considerations, where relevant. In particular, even if an offer does not meet all of the Type One and Type Two criteria and may raise some potential concerns based on analysing the Type Three criteria above, we will still consider the social benefits that the content provides to consumers and citizens, where relevant. In some circumstances, the social benefits of zero-rating offer may outweigh any potential competition concerns. Some examples of such benefits we may consider include:

- **Health and safety**: we will recognise the inherent benefit that zero-rated access to certain websites provides to improving UK citizens' health and safety. This may include, for example, charity helplines, mental health support and support for victims of crime.
- **Assisting low-income consumers**: we will recognise the benefit of zero-rating offers that provide relevant content to assist low-income consumers (e.g. zero-rated information from Citizens Advice).

[19] When assessing the market position held by either a zero-rated CAP or a zero-rating ISP, we intend to broadly consider the extent to which alternatives exist to these firms and their overall use by consumers. We do not intend to undertake a full market definition exercise and economic assessment similar to a Competition Act case. Nor are we seeking to establish if a firm possesses 'significant market power', as defined in the Communications Act 2003.

## Our approach to zero-rating when the general data allowance has expired

A1.49 In general, when an End-user's data allowance has expired, any zero-rated data should be treated the same as all other data. If all other data is blocked, the zero-rated data should also be blocked. Similarly, if all other data is allowed to continue but at a much-reduced bandwidth, the zero-rated data should be treated equivalently.

A1.50 However, where ISPs allow access to certain content to continue to be used without equivalent treatment to non-zero-rated data, we are unlikely to have concerns where the content that can still be accessed is limited to:

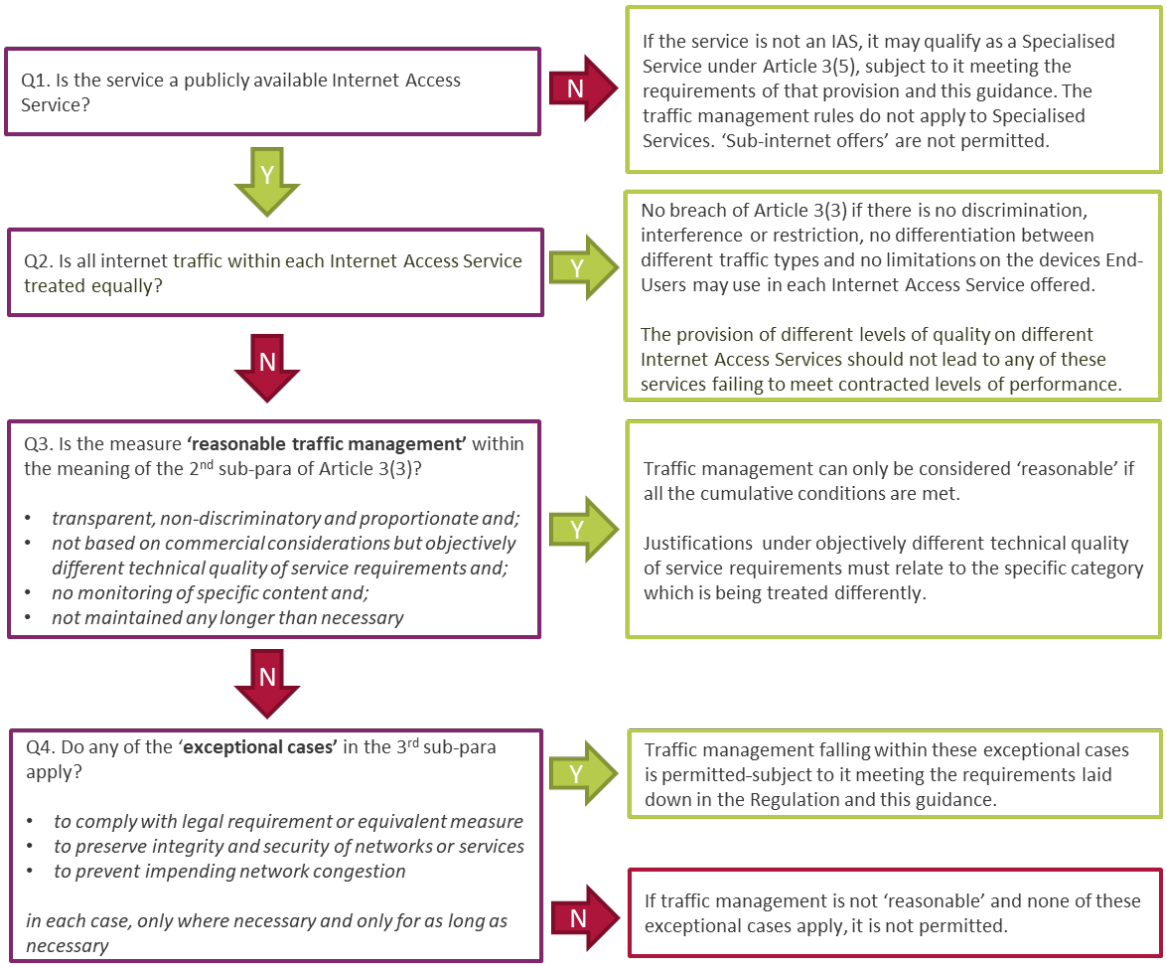
- access to the ISP's own website or Application in order for an End-user to top-up their data allowance;
- access to content under a Type One offer; or
- access to the emergency services (as explained below).

A1.51 In addition, we are unlikely to be concerned where ISPs continue to allow zero-rated access to important information for vulnerable customers (e.g. debt advice) where they have otherwise had their service restricted.

# Traffic management

A1.52 The Regulation provides for traffic management of Internet Access Services in certain circumstances and does not impose any restrictions on traffic management for services that are not Publicly Available Electronic Communications Services. On this basis, the following flowchart sets out how we will determine what approach to traffic management is appropriate.

**Figure A1.1: Flowchart illustrating how we will assess what approach to traffic management is allowed in particular circumstances**




A1.53 In the following sections we explain our approach to each of the questions 1 to 4 in the flowchart above.

## Question 1: Is the service a publicly available Internet Access Service?

A1.54 Only Publicly Available Electronic Communications Services are subject to the Regulation. In assessing whether a service is publicly available, ISPs should take account of paragraphs A1.14 - A1.21 on the scope of the Regulation.

A1.55 Services that are publicly available may not be an Internet Access Service. For example, they may be Specialised Services. Where a service is a Specialised Service, the traffic management rules do not apply but ISPs should take account of paragraphs at A1.125 – A1.153 on Specialised Services.

## Question 2: Is all traffic within each Internet Access Service treated equally?

A1.56 In considering whether traffic is treated equally, we will have regard to the paragraphs at A1.22 – A1.24 on equal treatment of traffic.

A1.57 Where an ISP offers different Internet Access Services with different characteristics, such as different QoS parameters, each of these different services should be considered separately. Where all traffic from all End-users of a particular service is treated equally, then there is unlikely to be a breach of Article 3, even where the traffic of this service is treated differently to the traffic associated with a different Internet Access Service offered by the ISP. In offering services with differentiated QoS, ISPs may prioritise all the traffic for the ISP's retail customers on one package over the traffic for customers on a different package, in order to ensure the contracted levels of quality of the Internet Access Services are met. In applying such traffic management, prioritising traffic for one set of customers should not result in the service provided to other customers not meeting the minimum quality offered for their service.

A1.58 ISPs may provide retail offers with multiple levels of QoS supported in a single package, where the End-users configure which traffic is treated with which QoS level. This would not be considered to breach the principle of equal treatment of traffic where traffic assigned by customers to equal levels of QoS are treated equally.

A1.59 Zero rating constitutes unequal treatment of traffic where zero-rated Applications can be accessed when other Applications are blocked due to data usage caps being reached (or any other reason). We have set out above the circumstances where this is unlikely to be a concern.

## Question 3: Is the measure reasonable traffic management?

A1.60 ISPs may implement reasonable traffic management. The objective of reasonable traffic management is to contribute to:

- an efficient use of network resources; and
- an optimisation of overall transmission quality responding to the objectively different technical Quality of Service requirements of specific categories of traffic, and thus of the Applications transmitted.

A1.61 The use of reasonable traffic management does not represent a breach of ISPs' obligations under Article 3.

A1.62 Reasonable traffic management measures applied by ISPs should meet all of the following criteria:

- be transparent, non-discriminatory and proportionate;
- not be based on commercial considerations but on objectively different technical QoS requirements of specific categories of traffic;
- not monitor the specific content; and
- not be maintained for longer than necessary.

### Proportionality

A1.63 The traffic management measure must be proportionate. As such, it has to be suitable to achieve the aim of contributing to an efficient use of the network and to an optimisation of overall transmission quality (with appropriate evidence to show it has that effect) and must be necessary to achieve this aim.

A1.64 The starting point of the traffic management framework is that all traffic is treated equally. Where ISPs apply measures that depart from this, they should use the measure that most

effectively addresses the concern whilst minimising the impact on other traffic and other End-users.

### Transparency

A1.65 There must be sufficient transparency provided to End-users to allow them to understand the traffic management that may be applied to their Internet Access Service, as discussed in paragraphs A1.154 – A1.161 below.

### Non-discriminatory

A1.66 A traffic management measure is likely to be non-discriminatory where traffic with similar technical QoS requirements receives similar treatment whilst traffic with objectively different technical QoS requirements is treated differently, in line with the differences in technical requirements.

A1.67 For example, one category of traffic may consist of real-time Applications requiring a short time delay between sender and receiver, whereas file download traffic may comprise very large volumes but may be less sensitive to delay. Reasonable traffic management could be used to assign network resources to these two categories based on these characteristics to optimise the End-user experience and make efficient use of network resources rather than treating them the same.

A1.68 In order to treat traffic differently based on differences in technical QoS requirements, traffic needs to be identified. The mere fact that network traffic is encrypted is not an objective justification for different treatment by ISPs. We discuss our approach to the identification of different types of traffic below.

### Based on objectively different Quality of Service requirements and not commercial considerations

A1.69 Traffic management measures are not reasonable where they are based on commercial considerations, such as where an ISP charges for usage of different traffic categories or where the traffic management measure reflects the commercial interests of an ISP that offers certain Applications or partners with a provider of certain Applications. Such an approach would also breach the requirement for traffic management to be based on objectively different technical characteristics.

### Shall not monitor specific content

A1.70 Traffic management measures will not be reasonable where they monitor the specific content (i.e. transport layer protocol payload). Monitoring techniques which rely on the information contained in the IP packet header, and transport layer protocol header (e.g. TCP) may be deemed to be monitoring generic content, as opposed to the specific content provided by End-users themselves (such as text, pictures and video).

### Identification of traffic in order to implement reasonable traffic management

A1.71 Our approach to reasonable traffic management allows for differential treatment of different categories of traffic based on ISPs identifying the technical characteristics of different traffic streams. For each Internet Access Service offered by an ISP, it should not treat specific Applications differently to other Applications of a similar category when reasonable traffic management is applied. In this instance, similar categories of traffic should be understood as traffic with similar technical QoS characteristics.

A1.72 Categories of traffic are not pre-specified. ISPs may determine the categories of traffic in a way that achieves the aim of contributing to an efficient use of the network and to an

optimisation of overall transmission quality, subject to meeting the criteria in relation to proportionality, non-discriminatory treatment and being based on objectively different Quality of Service requirements, not commercial considerations, as explained above.

A1.73 In order to identify traffic by category, ISPs may use traffic identification approaches that examine general characteristics of the traffic, but that do not examine specific data.[20] ISPs may implement reasonable traffic management using these traffic identification techniques as long as:

- the vast majority of traffic is identified;
- non-identification of traffic is very limited and can be objectively justified. Examples where non-identification may be justified include (but are not limited to) where the traffic presents a new set of general characteristics, or changes its general characteristics;
- the ISP uses techniques to identify encrypted traffic wherever possible. The presence of encryption itself should not be taken as a reason for traffic to not be identified, although we accept some encryption techniques will mean traffic identification is not possible;
- ISPs have in place appropriate processes to verify the accuracy of their approach to identifying traffic and they update the techniques and systems they use to identify traffic in a timely manner in line with technological developments, with the objective of improving the effectiveness of traffic identification;
- ISPs should regularly update their traffic identification databases to ensure that new traffic types are identified as soon as practical;
- traffic that is not identified so that it cannot be given appropriate treatment based on its technical characteristics should be treated as a single category;
- non-identified traffic should be treated equally (i.e. all non-identified traffic should receive the same treatment);
- non-identified traffic can be expected to include a range of Applications with different QoS requirements and should be treated appropriately. This could be by:
    - where the ISP has different treatment for multiple levels of identified traffic, treating the non-identified traffic the same as identified traffic with medium QoS requirements, rather than similar to identified traffic with high QoS requirements (such as strict latency requirements) or low QoS requirements (e.g. is very insensitive to latency); or
    - another approach as specified in the ISP's traffic management policy which demonstrates that non-identified traffic is not assumed to have lower quality requirements than identified traffic in general; and
- ISPs publish their approach to traffic management, including their traffic identification approaches and their approach to treatment of traffic that is not identified, in line with the transparency requirements discussed in paragraphs A1.157 – A1.161 below.

A1.74 Where ISPs cannot identify the majority of traffic or treat non-identified traffic in line with the above approach, any traffic management applied by the ISP should treat all traffic the same.

[20] Specific data would include the data in the payload of a packet. Data in the header of a packet would not be specific data.

### Shall not be maintained longer than necessary

A1.75 Measures that are maintained longer than needed would not meet the requirements set out above, as they would not be proportionate in terms of meeting the objective of optimising the overall efficient use of network resources. We discuss our approach to traffic management measures which are permanently deployed below.

### Other factors to consider

A1.76 The Regulation also states that blocking, slowing down (i.e. throttling), altering, restricting, interfering with, degrading or discriminating between specific Applications or specific categories of traffic are not permitted under reasonable traffic management. In particular, in applying reasonable traffic management, specific traffic or categories should not be treated inconsistently with the technical QoS characteristics of the traffic (for example slowing down latency sensitive traffic).

## Question 4: Do any of the allowed exceptional cases apply?

A1.77 Beyond reasonable traffic management, the third sub-paragraph of Article 3(3) allows for exceptional traffic management in three specific circumstances, to:

a) comply with national legislation, to which the ISP is subject, or with measures giving effect to such national legislation, including with orders by courts or public authorities vested with relevant powers;
b) preserve the integrity and security of the network, of services provided via that network, and of the Terminal Equipment of End-users; and
c) prevent impending network congestion and mitigate the effects of exceptional or temporary network congestion, provided that equivalent categories of traffic are treated equally.

A1.78 Where one of these exceptions applies, ISPs may apply additional traffic management measures going beyond reasonable measures as necessary, and only for so long as necessary. The extent to which this additional traffic management as described above may be necessary will depend on which of the three specific circumstances apply, as explained below.

### Comply with legislation or measures giving effect to legislation

A1.79 In relation to sub-paragraph (a), we consider that ISPs may rely on this exception where the specific traffic management action is proportionate and the minimum necessary to meet the obligation in the relevant legislation, order or administrative measure. Examples of the types of obligation that might fall into this exception would include legislation, court orders and General Conditions imposed by Ofcom. [21]

### Preserve the integrity of the network

A1.80 In relation to sub-paragraph (b), we consider that ISPs may rely on this exception where the specific traffic management action is proportionate and the minimum necessary to protect the integrity and security of the network from attacks and threats, which could typically include:

[21] We also consider that where ISPs block access to unlawful content identified by the Internet Watch Foundation (https://www.iwf.org.uk), this is likely to fall under the criteria in Article (3)(3)(a).

- flooding network components or Terminal Equipment with traffic to destabilise them (e.g. Denial of Service attack);
- spoofing IP addresses in order to mimic network devices or allow for unauthorised communication;
- hacking attacks against network components or Terminal Equipment; and / or
- distribution of malicious software, viruses etc.

A1.81 In considering implementing measures in relation to this exception, ISPs should also take account of any obligations under the Telecommunications (Security) Act[22] and its associated Regulations and Code(s) of Practice issued by the Secretary of State for the Department for Science, Innovation and Technology (DSIT), as well as any related Ofcom guidance. We are unlikely to be concerned where ISPs' actions are consistent with these.

### Prevent impending network congestion and mitigate the effects of exceptional or temporary congestion, provided that equivalent categories of traffic are treated equally

A1.82 ISPs are permitted to apply additional traffic management measures going beyond reasonable traffic management described above where those reasonable measures would not be effective in preventing impending congestion, and/or mitigating the effects of exceptional or temporary congestion. We consider that a part of the network is congested where the underlying network or network component (such as a link, node or cell site) is offered a greater traffic load than it can deliver within the design parameters set by the network operator. The parameters set by the network operator may include some or all of maximum latency, maximum jitter, maximum packet loss, and utilisation. These may be measured over the whole network, part of the network or on an individual network component, as appropriate.

A1.83 A part of the network is at imminent risk of congestion, where an ISP identifies:

- a scheduled traffic event, including an exceptional peak in traffic, which is expected to increase traffic load to the point where congestion is likely, based on the parameters above; or
- an ISP has not identified a scheduled event, but traffic is above the normally expected level to an extent that if traffic remained this far above the normal level, or continued to increase, congestion would be expected to occur.

A1.84 Exceptional congestion refers to unpredictable and unavoidable situations of congestion, both in mobile and fixed networks. Possible causes of those situations include a technical failure such as a service outage due to broken cables or other infrastructure elements, unexpected changes in routing of traffic or large increases in network traffic due to emergency or other situations beyond the control of ISPs. Such congestion problems are likely to be infrequent but may be severe, and are not necessarily of short duration.

A1.85 Temporary congestion refers to specific situations of short duration, where a sudden increase in the number of End-users in addition to regular End-users, or a sudden increase in demand for specific Applications, may overflow the transmission capacity of some elements of the network and make the rest of the network less reactive.

A1.86 Reasonable traffic management measures as outlined above should be employed to address congestion wherever possible. The rules also allow ISPs to take measures that seek to

[22] Telecommunications (Security) Act 2021.

provide an equitable share of available resources to End-users where this is not based on the specific Applications being accessed by End-users.

A1.87 Where additional traffic management measures are still required to address congestion, they should be limited in duration and frequency and should only be applied as necessary. In particular:

- ISPs are required to treat equivalent traffic equally. ISPs may use traffic identification in line with the guidance above to identify equivalent traffic. However, in order to address congestion, ISPs are not required to treat traffic based on its technical QoS characteristics where this is necessary to address the congestion or imminent congestion (for example, by not assigning sufficient capacity to a category of traffic to meet its QoS requirements where this traffic is overloading the network).
- An ISP may use additional measures not allowed under reasonable traffic management, including throttling, slowing, interfering with or blocking traffic, but only to the extent such measures are necessary to address the congestion or imminent congestion. ISPs must address congestion in the least intrusive manner. In this regard, blocking traffic would typically be regarded as more severe than throttling or slowing traffic and therefore we would expect to see blocking only in very limited circumstances.
- Additional measures should be targeted at the affected parts of the ISP's network, i.e. the parts of the network which are congested or where congestion is imminent, including the circumstances where it is, or expected to be, triggered by an exceptional peak in traffic. If this results in a differential treatment of traffic in the affected parts of the network compared to the rest of the network (e.g. throttling traffic in the affected parts of the network, while applying no active traffic management in the rest of the network), this would not be considered as a discriminatory traffic management practice. For clarity, where congestion is isolated to traffic on a dedicated link from a single CAP, action can be localised to address this.
- For each Internet Access Service offered, the ISP should not treat specific Applications differently to other Applications of a similar category within the affected part of the network. Where the ISP treats different categories of traffic differently within each Internet Access Service, it should identify the categories in line with the guidance given above for identifying traffic in relation to reasonable traffic management.

A1.88 Where congestion occurs on a more recurrent or longer-term basis, we expect that ISPs will build sufficient capacity to carry the traffic offered in the busiest period for each part of their network. The busiest period is the period of time where traffic is highest. This may, for example, be weekday evenings between 7 and 10pm.

A1.89 In planning their networks and considering the use of traffic management to address congestion, ISPs must ensure they have regard to their obligations in relation to network resilience.

A1.90 Congestion might occur especially in mobile networks, which are subject to more variable conditions, such as physical obstructions, lower indoor coverage, or a variable number of active users with changing locations. In general, we would expect the normal planning processes of the mobile network operator to address growth in traffic in a timely fashion through capacity expansion. The use of additional traffic management measures on an

extended basis should be limited to cell sites where capacity expansion is not practical in the short to medium term. This approach should not be needed to address increasing traffic volumes on the vast majority of cell sites. Use of these measures across the network more generally on a regular basis is unlikely to be consistent with the rules.

A1.91 Traffic management applied in the above circumstances needs to be necessary to address the concern it seeks to prevent or mitigate and be reflective of the severity of that concern. In particular, ISPs need to ensure that the degree of traffic management reflects the severity of congestion and should aim to bring traffic load close to the maximum design parameters set by the network operator.

A1.92 We will consider that traffic management practices are not necessary where they are applied:

- when the network is not congested or is not at risk of imminent congestion; or
- to areas of the network that are no longer congested.

## Traffic management measures which are configured on a permanent basis

A1.93 Some traffic management measures may be configured in the network on a permanent basis.

A1.94 Reasonable traffic management measures may be configured in the network (or parts of the network) on a permanent basis. However, we would expect that the measures only take effect, and have an impact, as the network becomes loaded and approaches its maximum capacity.

A1.95 Where additional traffic management measures are deployed permanently, they should have effect on traffic only for as long as necessary to address congestion.

A1.96 Some measures may have permanent effect (for example, blocking access to illegal content, see below). In addition, traffic management measures that treat traffic related to different Internet Access Services differently (where the traffic associated with each Internet Access Service is treated the same, see below) may have permanent effect.

A1.97 In all other cases, the measure should not affect traffic outside the specific and temporary conditions which it is targeted to address.

## Traffic management of Internet Access Services offered on transport services

A1.98 We recognise that there may be circumstances where technical limitations mean that providers of Internet Access Services on transport are likely to need to use certain traffic management techniques on an ongoing basis to ensure End-users receive a service of acceptable quality.

A1.99 In the absence of specific complaints or harm to End-users, these cases are unlikely to be a concern for us where traffic management is used to provide a reasonable level of service to as many users as possible.

A1.100 In considering whether traffic management is being used appropriately, we will take into account the extent of constraints on capacity leading to the use of traffic management, and how it is applied, including whether it unfairly targets specific Applications or types of traffic.

Where traffic is being blocked, we would expect that issues relating to incorrect or inadvertent blocking of content can be raised to the ISP.

A1.101 We also recognise that ISPs providing Internet Access Services on transport may block certain types of content (such as pornography and illegal content) in accordance with Government-supported initiatives such as Friendly Wi-Fi.[23] We are also unlikely to be concerned where ISPs block access to certain content in line with such schemes. We would expect ISPs to be able to explain why traffic is blocked and take action if this is inadvertent or in error.

A1.102 ISPs providing services on transport should provide information to End-users in relation to the following: (i) the traffic management techniques they use; and (ii) the possible impact this may have on the service.

## Traffic management of Internet Access Services offered in public spaces

A1.103 We recognise that Internet Access Services are often provided free of charge in public spaces, which may result in providers of these services being constrained in their ability to expand capacity.

A1.104 In the absence of specific complaints or harm to End-users, these services are unlikely to be a concern for us where traffic management is used to provide a reasonable level of service to as many users as possible. In considering whether traffic management is being used appropriately, we will take into account the extent of constraints on capacity leading to the use of traffic management, and how it is applied, including whether it unfairly targets specific Applications or types of traffic.

A1.105 We also recognise that ISPs providing Internet Access Services in public spaces may block certain types of content (such as pornography and illegal content) in accordance with Government-supported initiatives such as Friendly Wi-Fi. We are also unlikely to be concerned where ISPs block access to certain content in line with such schemes. We would expect ISPs to be able to explain why traffic is blocked and take action if this is inadvertent or in error.

A1.106 ISPs providing services in public spaces should provide information to End-users in relation to the following: (i) the traffic management techniques they use; and (ii) the possible impact this may have on the service.

# Retail offer differentiation

A1.107 In the same way that ISPs may offer retail packages with different speeds and data allowances, the net neutrality rules also permit ISPs to offer retail packages with different levels of QoS such as latency, jitter or packet loss, where the quality of Internet Access Service on each individual package is independent of the Applications accessed. Subject to considerations regarding transparency as set out below in paragraphs A1.163 to A1.164, and Internet Access Services generally meeting the contracted level of service quality, such retail offers are unlikely to breach the Regulation. These offers may:

a) apply the same QoS to all traffic for a given End-user; or

[23] What is the 'Friendly WiFi' Scheme? - UK Safer Internet Centre [accessed 1 September 2023].

b) provide multiple QoS levels within a single package, where the level of QoS is determined by the End-user rather than the ISP. An example of such a retail offer would be where an End-user can subscribe to an add-on to (temporarily) boost their Quality of Service or vary the contracted Quality of Service across the day.

A1.108 Where an ISP offers Internet Access Services with different levels of QoS through different retail offers, they are permitted to manage these services differently in order to deliver the respective contracted levels of performance in line with our general approach to traffic management.

# Public interest exceptions

## Approach to emergency communications

A1.109 Voice telephone calls to 999 are treated as a priority and communications providers are required by Ofcom's General Conditions to ensure uninterrupted access to the emergency services for voice 999 calls. Some newer, alternative means of contacting the emergency services, including emergency video relay, rely on internet access for connectivity.

A1.110 GCs C5.11 and C5.12 require providers of Internet Access Services to provide, or contract to provide, emergency video relay to enable communications with the emergency services. Specifically, GC C5.12d states that '*In providing access to and facilitating use of Emergency Video Relay Services under condition C5.11, Regulated Providers must: d) subject to Condition C3.11, ensure that the Emergency Video Relay Service is available for lawful use by End-Users at all times*.'[24]

A1.111 GC C5.12d presents an obligation on providers to ensure that emergency communications that rely on internet access can be used continuously.

A1.112 In light of this, where an ISP needs to prioritise or zero-rate communications with the emergency services, and where it needs to continue to provide these services when general data allowance is exhausted, to meet the conditions imposed on regulated providers by GC C5.12d, this would constitute a legal obligation within the meaning of Article 3(3)(a) of the Regulation and an exception to the traffic management rules would apply.

## Approach to restricting access to scam websites

A1.113 Internet Access Services may be used to access scam websites and fraudulent content. If ISPs block access to scams or fraudulent content, we are unlikely to have concerns where this is done reasonably. In considering whether blocking is carried out on a reasonable basis we will consider if it is carried out on a proportionate, targeted and appropriately evidenced basis and whether there is a clear and accessible mechanism in place to allow CAPs and End-users to report inappropriately blocked content.

## Approach to parental controls and other content filters

A1.114 We support the provision and use of content filters, provided End-users have control over their operation. Content filters can be operated within an ISP's network (i.e. in-network), which are within the scope of the Regulation, or they can be implemented outside of an

[24] Ofcom, 2021. *Statement: Emergency video relay*

ISP's network (e.g. such as Applications on handsets or software in an End-user's router), sometimes referred to as 'over-the-top', which is outside of the scope of the Regulation.

A1.115 We are unlikely to be concerned about in-network content filtering undertaken by ISPs where this is done reasonably. In considering this, we will assess if it is carried out on a proportionate, targeted and appropriately evidenced basis and whether there is a clear and accessible mechanism in place to allow CAPs and End-users to report inappropriately blocked content. We will also take into account whether End-users have free choice and can take informed decisions over the use of such filters.

### Vulnerable consumer information

A1.116 Where ISPs allow access to certain Applications or web pages, while blocking or restricting access to others, this is generally not allowed by the Regulation.

A1.117 Our vulnerability guidance highlights the serious harm that service disruption can have on vulnerable consumers and calls on providers to protect, where possible, "calls to free helplines dedicated to e.g. protecting children and domestic abuse victims, even during service restrictions, and making customers under service restrictions aware of this approach".[25] The guidance also encourages providers to "include information in payment and collection related communications about where customers can access free debt advice".[26] ISPs may choose, for example, to include phone numbers but also web pages.

A1.118 We are unlikely to be concerned where ISPs take reasonable steps to allow access to web pages providing free debt advice and other important information with clear public benefit, while otherwise blocking Internet Access Services. In considering this, we will assess if it is carried out on a proportionate, targeted and appropriately evidenced basis and whether there is a clear and accessible mechanism in place to allow CAPs and End-users to report inappropriately blocked content.

### Intimate image abuse

A1.119 We are unlikely to be concerned where ISPs are working with charities and other organisations focused on addressing content that amounts to intimate image abuse (IIA). In addition to considering whether any actions taken by ISPs are proportionate, targeted and appropriately evidenced, we will also take into account that other approaches may be available, including the use of court orders (which would allow ISPs to block traffic under paragraph (a) of Article 3(3)), or agreements with CAPs which would sit outside the net neutrality framework.[27]

## Terminal Equipment

A1.120 Article 3(1) of the Regulation states that End-users have the right to use the Terminal Equipment of their choice when accessing the internet.

A1.121 Article 3(2) of the Regulation requires that commercial agreements between ISPs and End-users concerning the commercial and technical characteristics of an Internet Access Service

[25] Ofcom, 2022. *Treating vulnerable customers fairly*, para. 4.55.
[26] Ofcom, 2022. *Treating vulnerable customers fairly*, para. 4.56
[27] Intimate image abuse relates to the non-consensual disclosure of, or threats to disclose, intimate images.

must not limit the End-users' rights specified in Article 3(1) of the Regulation. Therefore, ISPs should not include commercial terms or impose any technical limitations, including fair usage policies, which restrict the use of Terminal Equipment with Internet Access Services, beyond any restrictions already imposed by manufacturers or distributors of Terminal Equipment. ISPs may only provide obligatory equipment or restrict the devices that may be used to access Internet Access Services if such restrictions result from technical necessity of the relevant Internet Access Services.

A1.122 Article 3(3) also requires ISPs to treat all internet traffic equally, irrespective of the Terminal Equipment used.[28] For example, restrictions on the practice of tethering, which allows an End-user to share the internet connection of a phone or tablet with other devices such as laptops, are likely to constitute a restriction on the use of Terminal Equipment.

A1.123 Where End-users use networks at a high intensity and contribute to congestion, to the detriment of other users, ISPs may undertake actions to ensure that they can provide a reasonable level of service to as many users as possible. Under these circumstances, ISPs may allocate network resources between End-users in an equitable way, subject to transparency requirements set out in Article 4(1) of the Regulation. Such measures should be proportionate and must still allow End-users a reasonable level of service, subject to the network capacity and demand at the specific time and area.

A1.124 ISPs may also specify contractual terms such as fair usage policies that are appropriate for a particular Internet Access Service.[29] These must be communicated clearly to customers and consistent with the transparency requirements as set out in Article 4(1) of the Regulation.

## Specialised Services

A1.125 Article 3(5) of the Regulation recognises that there may be demand for Applications which have quality requirements that are not supported by Internet Access Services. It permits the provision of Specialised Services – services other than Internet Access Services, optimised to the requirements of such Applications, subject to certain conditions that are intended to safeguard the continued availability and general quality of Internet Access Services.

A1.126 Article 3(5) imposes certain conditions on the provision of Specialised Services, including that:

a) optimisation is necessary in order to meet requirements of Applications for a specific level of quality;
b) network capacity is sufficient to provide them in addition to any Internet Access Services provided;
c) such services shall not be detrimental to the availability or general quality of Internet Access Services for End-users; and
d) such services shall not be usable or offered as a replacement for Internet Access Services.

[28] Although it is worth noting that ISPs may provide differentiated retail offers as discussed at paragraphs A1.107 - A1.108.
[29] For services with a limited data allowance, we would not expect any usage below that allowance to trigger actions under a fair usage policy.

A1.127 As discussed in paragraphs A1.14 - A1.15 above, these conditions apply only to Publicly Available Electronic Communications Services.

A1.128 We set out our approach to assessing if these conditions are met below.

## Optimisation is necessary in order to meet requirements of Applications for a specific level of quality

A1.129 A Specialised Service is a service which is optimised for specific Applications which have a quality requirement that is not supported by an Internet Access Service.

A1.130 When assessing whether a service meets this requirement, we would expect the ISP to be able to demonstrate that:

a) The service is optimised for specific Applications.
b) The Applications have quality requirements which necessitate optimisation because they cannot be met consistently by the ISP's Internet Access Services during normal operation. This could be done by identifying the parameters which are not supported by an Internet Access Service and the impact on the service if it is not optimised (that is, the service features which would not be able to function fully if delivered via a general Internet Access Service).[30]

A1.131 Normal operation should be interpreted to be the operation of the network generally when not experiencing exceptional or temporary congestion that would mean additional measures are being applied as described in paragraphs A1.77 – A1.92. It should also consider whether the Application's requirements can be met by the use of reasonable traffic management measures as described above in paragraphs A1.60 - A1.76.

A1.132 The quality requirements may relate to one or more service characteristics. Optimisation may for example be required because the Application requires:

- A level of performance greater than supported by the Internet Access Service. For example:
  - a real time application, such as remote surgery, which requires lower latency;
  - a multicast application with specific QoS requirements; or
  - a video Application which requires much greater bandwidth to support a higher video resolution.
- A more consistent or reliable level of performance than supported by the Internet Access Service to operate optimally. For example, telephony and other person to person voice and video Applications are typically sensitive to quality variations. This could be the basis for considering providing a Specialised Service.[31]
- A high level of service assurance or security because of the nature of the Application. For example, critical network infrastructure related applications or machine to machine communications applications.

[30] ISPs may take different approaches to delivering Specialised Services over access connections to End-users. These may include delivering traffic as part of an IAS or on a separate logical or physical channel. Assessment of whether the Specialised Services criteria are met should be based on the end-to-end requirements of the service and not the technical approach to delivery of the service to the End-user.

[31] Excessive latency can cause callers to talk over each other. Excessive latency and packet drop can result in missed words and poor voice quality. Similarly, quality variations can cause video conferencing to freeze or break-up.

- A service designed to suit specific device characteristics. For example, in some machine-to-machine applications, devices may be resource-constrained (limited processing power, memory capacity or battery capacity).

A1.133 More generally, corporate customers may be likely to use Applications which have quality requirements that are not supported by Internet Access Services.

A1.134 A Specialised Service may provide access to Applications which are accessible using an ISP's Internet Access Service, provided that it is optimised to meet quality requirements that cannot be supported by the Internet Access Service. For example, an ISP could offer a Specialised Service to provide access to a virtual reality Application, which has quality requirements (such as latency) for optimal performance which are not supported by the Internet Access Service. In this example, the Application may still work using the Internet Access Service but at a sub-optimal level, for example where functionality that depends on the Specialised Service operates inconsistently or this functionality is not available at all via internet access.

A1.135 On the other hand, various techniques enable many types of Applications to cope with the variable quality of Internet Access Services. For example, many video streaming Applications can accommodate variations in bandwidth and latency by buffering several seconds of content on the device. Adaptive bit rate techniques can also be used to ensure service continuity by dynamically adjusting video quality to suit connection conditions. Where such techniques meet Application quality requirements, a Specialised Service would not be required.

a) ISPs may offer Specialised Services to CAPs, but ISPs must not require CAPs to use such services to deliver their traffic. We would be particularly concerned if the Quality of Service delivered by an ISP's Internet Access Service reduced, or an ISP did not invest in normal network improvements, in order to encourage End-users (particularly CAPs) to use a Specialised Service to guarantee traffic delivery. We are likely to view this as inconsistent with our duty to promote the continued availability of non-discriminatory Internet Access Services at levels of quality that reflect advances in technology. [32]

### Assessment of requirements for new Applications

A1.136 Requirements of new Applications, and their need for optimisation, may not be completely understood until the Application has been launched and has gained a degree of maturity. ISPs should be able to demonstrate a reasonable expectation of the need for optimisation through, for example, technical assessments or service trials, where new Applications are launched using Specialised Services.

### Improvements in an Internet Access Service quality such that optimisation is no longer required to meet requirements for a specific level of quality

A1.137 The general quality of Internet Access Services is expected to continue to improve over time in response to consumer demand and in line with developments in technology. Such improvements may obviate the need for Specialised Services to support certain Applications.

[32] Section 7 of the Open Internet Access (EU Regulation) Regulations 2016 as amended by the Open Internet Access (Amendment etc.) (EU Exit) Regulations 2018.

A1.138 In cases where improvements to an Internet Access Service result in it meeting the quality requirements of specific Applications, the first condition of Article 3(5) is no longer met. Consequently, the Specialised Service must be withdrawn.

A1.139 In some cases, usage of a Specialised Service may lapse naturally as a result of such improvements, for example when an End-user upgrades to a better Internet Access Service.

A1.140 We recognise there may be circumstances when it may be appropriate for ISPs to manage the withdrawal of the Specialised Service over some time. In these cases, ISPs should have a reasonable withdrawal process in place taking account of the need for customers of the service to make any necessary changes to their services or applications.

## Network capacity is sufficient to provide the Specialised Service, such that the Specialised Service is not detrimental to the availability or general quality of Internet Access Services

A1.141 ISPs must ensure there is sufficient network capacity to support the provision of a Specialised Service in addition to any Internet Access Service, such that the Specialised Services are not detrimental to the availability or general quality of Internet Access Services for End-users.

A1.142 When assessing whether an ISP has met these requirements, we would expect it to be able to demonstrate that it has taken steps to ensure that there is sufficient network capacity to support the Specialised Service in addition to any Internet Access Services.

A1.143 We recognise that ISPs may have different approaches to capacity planning and management and that ISPs may not use the same approach in all parts of their networks. The following approaches would be acceptable ways for ISPs to ensure sufficient capacity is available:

- deploying additional capacity in accordance with a capacity forecast which takes account of the demand for Specialised Services and Internet Access Services; or
- monitoring traffic growth in individual network elements and deploying additional capacity to keep ahead of demand.

A1.144 In some cases it may be sufficient to demonstrate that a Specialised Service would not have a significant impact on Internet Access Services, for example because:

- the Specialised Service traffic is logically or physically separated from Internet Access Service traffic;
- the Specialised Service does not make significant demands on network resources; or
- the Specialised Service is used outside peak traffic periods.

A1.145 We would be most likely to consider that we should undertake an assessment of the impact of a Specialised Service on Internet Access Services where the introduction of a Specialised Service has an ongoing effect on the quality of the ISP's Internet Access Services, particularly where the ISP has indicated that a CAP should use a Specialised Service to guarantee traffic delivery.

A1.146 When assessing the impact of a Specialised Service on Internet Access Services, we would consider the impact to be detrimental to the availability or general quality of Internet Access Services if it causes the quality to fall below the applicable contractual quality standards for the services.

A1.147 In the absence of contractual quality standards, we would consider the impact to be detrimental if it causes the quality to degrade significantly, as measured by standard QoS parameters, such as bandwidth, latency, jitter, packet loss and congestion. Where the ISP offers multiple retail offers with different levels of quality or speed, we would expect quality to be maintained on all of its Internet Access Services.

A1.148 There is inherent variability in the QoS that mobile services, including Internet Access Services, can consistently achieve due to the nature of mobile radio access networks as explained in paragraph A1.90 above. In considering the impact of Specialised Services, we would not normally expect to consider such inherent variability to indicate that the Specialised Services are detrimental to the availability or general quality of Internet Access Services.

A1.149 Where ISPs provide Specialised Services, they may still apply traffic management to their general Internet Access Services in line with the traffic management guidance above.

A1.150 The traffic management requirements in Article 3(3) do not apply to Specialised Services and ISPs are free to manage these services as they choose.

A1.151 Exceptionally, in cases where an access connection serving an individual End-user has limited capacity and cannot be easily upgraded, it may not be possible to provide a Specialised Service unless the bandwidth of the End-user's Internet Access Service is reduced to accommodate it. This would not be considered detrimental to the general quality of the Internet Access Service contrary to Article 3(5). However, pursuant to Article 4(1) of the Regulation and General Condition C1, the ISP must provide the End-user with certain information about the service characteristics of the Internet Access Service, including a clear and comprehensive explanation of the impact that the Specialised Service might in practice have on the Internet Access Service.[33]

### Such services shall not be usable or offered as a replacement for Internet Access Services

A1.152 Internet Access Services provide connectivity to virtually all end points on the internet whereas Specialised Services should provide access for specific Applications only where optimisation is needed. Specialised Services should not be capable of being used to generally access services or end points across the internet (where the need for optimisation has not been established), as this would suggest that the End-user is accessing internet content without the equal treatment of traffic rules applying, so that the aims of the Regulation are being circumvented.

A1.153 Where a Specialised Service is used to provide a virtual private network, the provision of an Internet Access Service as part of the virtual private network service is not considered to be a replacement for an Internet Access Service, contrary to Article 3(5).

## Transparency

A1.154 ISPs are required to provide information to End-users about the Internet Access Services they offer. Article 4 sets out the minimum requirements for information that should be provided in Internet Access Service contracts. ISPs must also comply with their obligations

[33] Transparency is discussed from paragraph A1.154 onward.

under the General Conditions, specifically GC C1.3, C1.4 and C1.7, including the requirements in Table A and Table B in the annex to GC C1.

A1.155 Regarding volume limitations, contracts should specify the 'size' of the cap (in quantitative terms, e.g. GB), what that means in practice and the consequences of exceeding it (e.g. additional charges, speed restrictions, blocking of all traffic etc.) as well as, in the case of price differentiation, a clear explanation of which data is counted under which cap or for which price. For example, if an End-user gets uncapped access to the internet during a limited period of time, there must be a clear explanation as to the different time periods and which price applies to data during the different time periods. If the speed will decrease after a data cap has been reached, that should be taken into account when specifying speeds in a contract and publishing the information. Information should be provided in a way that is understood by End-users, for example by explaining what kind of data usage would lead to a situation where the data cap is reached (e.g. indicative amount of time using popular applications, such as SD video, HD video and music streaming).

A1.156 ISPs are also required to ensure that End-users can identify and take effective action where there are significant, continuous or regularly occurring discrepancies between the actual performance and what has been agreed in the contract. This includes the requirements that ISPs:

- provide a clear and comprehensible explanation of the remedies available to End-users which can be used in the event of any continuous or regularly recurring discrepancy; and
- put in place transparent, simple and efficient procedures to address the complaints of End-users.

## Traffic management

A1.157 ISPs should inform End-users in a clear manner how the traffic management practices they deploy might have an impact on the quality of Internet Access Services, End-users' privacy and the protection of personal data as well as about the possible impact of services other than Internet Access Services to which they subscribe, on the quality and availability of their respective Internet Access Services.

A1.158 ISPs should clearly explain when traffic management will be used, how it will be applied, and the impact this may have on specific End-users. Where ISPs offer retail services with differentiated quality, ISPs should set out how traffic management will impact End-users, including informing them of the impact of traffic management on their service.

A1.159 Where ISPs apply any traffic management, we would generally expect the following information to be made available to retail customers:

- a description of each category of traffic;
- an explanation of traffic management measures applied, where there is no congestion, including explanation of times when traffic management is applied (e.g. busy hours), and the impact on each traffic category, as predefined in traffic management rules; and
- an explanation of additional traffic management measures applied when there is congestion on the network, in particular the impact they have on different traffic categories and End-users (for example, that they are used to give an equitable allocation of network resources to End-users during network congestion).

A1.160 Where ISPs provide parental controls and other content filters, block access to scam websites or other content where there is a public interest (such as in relation to intimate image abuse), or allow access to certain content when the Internet Access Service is otherwise blocked or suspended, ISPs should provide information on their approach to End-users.

A1.161 ISPs that provide Internet Access Services on transport or in public spaces should provide information to End-users on any traffic management policies they apply to the service, including where access to certain content is blocked (for example due to the Friendly Wi-Fi initiative).[34]

## Zero-rating

A1.162 When providing zero-rating offers, ISPs should clearly explain to End-users which CAPs are zero-rated as part of their mobile tariff, including what aspect of the CAP's content is and is not zero-rated as part of their package. For example, if not all the content within an Application or website is zero-rated, this should be explained to End-users in a way that is meaningful to them.

## Differentiated Retail Offers

A1.163 As explained above, ISPs may offer packages with different characteristics in addition to speed and data allowance (for example, in relation to different levels of quality parameters). When offering such packages, sufficient transparency must be provided.

A1.164 Specifically, in providing these offers, ISPs will need to ensure that all their customers, in particular customers on packages with a lower quality, can understand what is offered under different packages and how this might affect their quality of experience. ISPs should ensure that the information provided in relation to quality parameters allows End-users to understand how these parameters might affect usage and user experience, for example by setting out how different Applications may be impacted with different packages under different network conditions. This could include both contracted performance standards on elements such as latency, jitter or packet loss and information that allows customers to form meaningful expectations about standards of quality and what this means in terms of their expected experience.

# Monitoring, reporting and compliance

A1.165 Under Article 5 of the Regulation, Ofcom has a duty to promote the continued availability of non-discriminatory internet access at levels of quality that reflect advances of technology.[35] In addition, Article 5 sets out a number of areas for Ofcom to monitor and ensure compliance with Articles 3 and 4. It also provides us with the power to request information

[34] What is the 'Friendly WiFi' Scheme? - UK Safer Internet Centre [accessed 1 September 2023].

[35] Article 5(1) of the Regulation. Additionally, Section 7 of the Open Internet Access (EU Regulation) Regulations 2016 as amended by the Open Internet Access (Amendment etc.) (EU Exit) Regulations 2018 also gives Ofcom powers to "impose requirements" to "*ensure the continued availability of non-discriminatory internet access services at levels of quality that reflect advances in technology*". To date, we have not exercised these powers.

to support our monitoring and supervisory activities. The particular areas set out in Article 5 are:

a) supervision, which encompasses monitoring, of:

i) Restrictions of End-user rights (Article 3(1));
ii) Contractual conditions and commercial practices (Article 3(2));
iii) Traffic management (Article 3(3));
iv) Internet Access Service performance and the impact of Specialised Services on the general quality of Internet Access Service (Article 3(5) and Article 4); and
v) Transparency requirements on ISPs (Article 4).

b) enforcement, which can include a variety of interventions and measurements; and
c) reporting by Ofcom on the findings from its monitoring.

A1.166 We set out below our general approach to monitoring and data gathering to meet these requirements.

## General approach to monitoring

A1.167 To support our monitoring we will gather data from ISPs on a regular basis. This will include:

- general network performance;
- relevant ISP policies, particularly in relation to the use of traffic management by the ISP;
- information on the use of additional measures going beyond reasonable traffic management; and
- information on the ISP's retail offers, zero-rating offers and Specialised Services.

A1.168 We may, on a case-by-case basis, request further information where we have a particular concern in relation to an ISP's approach to meeting its obligations under the Regulation.

A1.169 We do not expect ISPs to provide information to us except in response to our information requests.

A1.170 We set out more detail on the information we expect to gather below. We expect ISPs will be able to provide this information on request from Ofcom.

### General network performance

A1.171 Data on general network performance will be important to allow us to assess the general quality of Internet Access Services offered by ISPs. It will also provide a baseline against which we can assess the impact of new retail offers and Specialised Services and the use of traffic management measures.

A1.172 We expect to focus on measures of network utilisation, including the proportion of network elements experiencing a measure of congestion. We will gather:

- for mobile networks, information on the number and proportion of cell sites in an MNO's network that are congested; and
- across mobile and fixed networks, information on the number and proportion of nodes and links in the backhaul, core and Interconnection networks that are congested.

A1.173 We will agree with the ISPs the specific measures to gather, with the aim of gathering consistent data across ISPs. This will include the metric used by the ISP to consider a network element to be congested.

A1.174 Where possible we will seek to use data collected for ISP's internal reporting of their general network performance.

A1.175 We expect the data we collect will show the above information for each month. We will gather the data at least annually to support our annual monitoring report. We may gather the data more often if necessary but do not expect to gather data on a monthly basis (i.e. we expect our information requests will cover the data for a number of months, generally for a full year).

### Traffic management policies

A1.176 As explained above, ISPs may use traffic management in accordance with the Regulation.

A1.177 To enable us to monitor this, we will gather data on the ISPs' traffic management policy. We expect this to cover:

- details of the Internet Access Services that the policy pertains to;
- what traffic management practices will be used and the particular circumstances where these practices would take effect;
- where different traffic (or categories of traffic) is treated differently:
  - description of the approach used to identify traffic;
  - categories of traffic identified and an explanation of their technical characteristics;
  - proportion of total traffic that is identified;
  - reasons why traffic is not identified;
  - how traffic that is not identified is treated;
  - description of systems used to identify traffic including the approach to updates to improve accuracy of identification.

A1.178 Where the ISP offers multiple Internet Access Services, we expect to gather the different approaches taken for each service, and how this approach is used to deliver the contracted quality levels where these apply. In general, we expect this should be sufficient to provide the information we need to monitor the use of reasonable traffic management, as explained in paragraphs A1.60 - A1.76 above.

A1.179 We would also expect ISPs to be able to provide information about how traffic management is used in order to provide parental controls and other content filters, block access to scams or allow access to information for vulnerable consumers when access is otherwise blocked or suspended.

### Use of additional traffic management measures

A1.180 In addition, we will gather information on situations where additional traffic management has been applied to address congestion in line with Article 3(3)(c), as explained above in paragraphs A1.77 - A1.92.

A1.181 We expect that additional traffic management measures to address congestion will be used on a relatively limited basis. However, given the potential impact on End-users including CAPs, we expect ISPs to be able to provide information on request relating to each instance it is applied, including:

- the reason for using the additional traffic management measures;
- the impact of the measures on traffic and network performance;
- the specific traffic management measures that were applied and in which parts of the network;

- the information used to determine that congestion was imminent or occurring; and
- the dates and times when the traffic management measure was applied.

A1.182 Where the information above (for example in relation to the measures used or the approach taken to determine congestion was imminent or occurring) is in line with the traffic management policy, a reference to the policy is likely to be sufficient.

A1.183 In the case of mobile access networks, where congestion may persist for longer periods, we would expect the ISP to provide data on its approach to managing traffic on the impacted cell site(s) in periods of congestion - we do not expect to gather data on each application of the additional measures unless we have specific concerns about the measure used or the impact of it.

### Traffic management configured on a permanent basis

A1.184 Where ISPs implement traffic management measures that are configured permanently on their networks, the ISP should be able to provide Ofcom with information to assess these measures. Where this is not sufficiently explained in the traffic management policies, further data we would expect to be available would be:

- What permanent measures have been implemented on their network, and which parts of the network are covered by each measure, explaining what traffic management practice is applied and the traffic to which this is applied.
- The circumstances under which the measure is expected to impact traffic, and how these measures meet the relevant requirements.
- The dates, times, duration and location on the network when this traffic management measure has impacted traffic.

### Our approach to monitoring zero-rated offers

A1.185 We will gather data on whether ISPs have launched zero-rating offers.

A1.186 Where this is the case, we will gather data regarding the Applications being zero-rated, the requirements for new CAPs to join the offer and the information that is provided to End-users including CAPs about the offer. This will allow us to check whether the offer is Type One or Type Two, in which case we do not expect to gather further data unless concerns are raised to us by End-users including CAPs. We expect this data will be readily available for ISPs as this data should be made publicly available to meet the ISP's transparency requirements.

A1.187 We do not expect to regularly gather additional data that will allow us to assess Type Three offers. Where we consider it necessary to carry out an assessment of these offers, we will request the data on a case-by-case basis.

### Our approach to monitoring differentiated retail offers

A1.188 We will gather data on whether ISPs have launched differentiated retail offers.

A1.189 Where this is the case, we will gather information demonstrating:

- the different levels of QoS parameters for each retail offer, where relevant;
- that the different levels of QoS for different retail offers apply independently of the Applications accessed;
- compliance with the requirements regarding services meeting the contracted level of Quality of Service;

- that the ISP has provided sufficient transparency of the different retail offers to End-users; and
- information in relation to the application of traffic management measures.

### Our approach to monitoring Specialised Services

A1.190 We will gather data on whether ISPs have launched Specialised Services.

A1.191 Where this is the case, in order to understand how the Specialised Service meets the criteria set out in this guidance, we will gather:

- network performance data as explained above. These metrics will allow us to assess the general quality of Internet Access Services being provided by ISPs. This information will also provide a baseline against which we can assess the impact of Specialised Services.
- a summary of the Application and its requirements to which the offer applies and the likely level of traffic, along with information on how the service is managed where this is not already set out in the information that we will gather about ISPs general traffic management policy.

### Frequency of data gathering

A1.192 We would expect to gather the above data annually, but may request it more frequently where it appears to us that ISPs are using traffic management measures or are launching or changing their offers on a regular basis.

A1.193 Where ISPs do not alter their traffic management policies on an annual basis, or do not change their offers, we will review the extent to which additional data beyond confirmation that the same information as previously supplied still applies is necessary.

## Additional data gathering

A1.194 In addition to the reporting set out above, we will gather data on a case-by-case basis where additional data is necessary, for example where we are concerned that an ISP may not be compliant with the Regulation or concerns are raised with us (for example by End-users including CAPs).

A1.195 Whilst we may request any data necessary to monitor compliance, we expect ISPs would be able to provide at least the following data:

- **Traffic management**: details of any use of traffic management outside the ISP's policy, and details of the impact of this use of traffic management on the network, including the impact on QoS characteristics.
- **Zero-rating**: where ISPs launch zero-rating offers, we may gather information related to the characteristics of the offer, and the assessment undertaken by the ISP to ensure compliance with the Regulation and this guidance, particularly in the case of offers that appear to meet the Type 3 criteria. This may include number of customers, customer data usage information, data usage associated with zero-rated content and information on engagement with CAPs providing similar services that are not included in the offer.
- **Differentiated retail offers**: information to determine whether End-users understand the offers, or to determine where the approach may restrict access to certain CAPs. This may include take-up or forecast take-up of different offers, information on complaints relating to specific offers and the impact of new services, such as increased congestion and the mitigating approaches being taken,

where this is not clear from the general data collected on an ongoing basis as explained above.

- **Specialised Services**: information about the ISP's assessment that a Specialised Service is needed (for example data on the ISP's assessment of the need for optimisation) and any further information about how network capacity is managed so that the Specialised Service does not negatively impact on Internet Access Services.

## Monitoring of the provision of Internet Access Services on transport and in public spaces

A1.196 We would expect that ISPs providing services on transport and in public spaces would be able to provide information on request demonstrating how traffic management is applied on the service, where it is used and information on any capacity constraints applying to the service. This should also include where content is blocked, for example in relation to the Friendly WiFi scheme.

## Retaining information

A1.197 The information set out above may be used for Ofcom's general monitoring and annual reporting. As such, ISPs should maintain data for a period of time to provide to Ofcom on request for monitoring and reporting purposes, in addition to any specific request related to compliance monitoring or assessments.

A1.198 Where data relates to a specific offer (such as zero rating, differentiated retail offers and Specialised Services), we would expect the ISP to be able to provide the relevant data throughout the period the offer is active and for 18 months afterwards. In relation to general network performance monitoring and data on the use of traffic management, we would expect ISPs to keep this data for 18 months after the end of the month to which the data relates.

# A2. International case studies

A2.1 As part of our review, we have assessed the net neutrality frameworks of several international jurisdictions to inform our thinking.

A2.2 In this annex, we detail case studies from the European Union (EU) (including a short focus on Italy), the United States of America (USA), Singapore and South Korea.

A2.3 Apart from the USA, which currently does not have a net neutrality framework in place at the federal level, we note that the basis of the frameworks in the EU, California, Singapore and South Korea are similar to that in the UK in that they are concerned with preventing the blocking of legitimate content, requiring information transparency and allowing reasonable traffic management in certain circumstances.

A2.4 However, the exact nature of the rules differ from jurisdiction to jurisdiction, e.g. Singapore allows traffic management based on commercial considerations (including allowing ISPs to offer priority for gaming services), and the EU has clarified that 'non-application-agnostic' zero rating offers are incompatible with EU law.

A2.5 In addition, recent cases in South Korea and Italy have respectively demonstrated the existence of other complementary market arrangements and legislative levers to help ensure network integrity and functioning that sit outside of their net neutrality frameworks.

## European Union

A2.6 Net neutrality in the EU is governed by the Open Internet Regulation (the 'Regulation'), which was agreed in 2015 and came into effect at the end of April 2016.[36]

A2.7 Under Article 5(3) of the Regulation, the Body of European Regulators for Electronic Communications (BEREC) is obliged to issue guidelines for the implementation of the obligations of National Regulatory Authorities (NRAs) to help ensure consistency of the application of the Regulation and to promote an effective internal market in the electronic communications sector.

A2.8 Under Article 9 of the Regulation, the European Commission is required to review the Regulation's provisions on open internet access (Articles 3,4,5, and 6) and submit a report to the European Parliament and the Council of the EU, "accompanied, if necessary, by appropriate proposals with a view to amending the Regulation" on a periodic basis. A first report on this matter was issued by the European Commission on 30 April 2019, and the Regulation states that this should be followed by subsequent reviews every four years thereafter. In line with this requirement, a second report was published on 28 April 2023 with the aim of providing an assessment of the implementation of the four articles of the Regulation since 2019.[37] As part of this process, BEREC published an opinion stating they considered that the Regulation was "fit for purpose" and that it saw "no merit in changing

[36] Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access and retail charges for regulated intra-EU communications and amending Directive 2002/22/EC and Regulation (EU) No 531/2012.

[37] European Commission, 2023. *Second report on the implementation of the Regulation on Open internet access*.

the text" of the Regulation.[38] In its second report, the European Commission, while highlighting specific issues that deserved "special attention" by it and BEREC in the "near future" (e.g. better clarifying which specialised services should be possible within the scope of the Regulation), did not propose any changes to the Regulation. It concluded that "compared with the situation in 2019 when the first report was issued, the principles of an open internet remain relevant, from the perspective of end-users, content and application providers, and internet access service providers".[39]

## Zero-rating and CJEU rulings

A2.9 Historically, BEREC had recommended that NRAs should undertake a comprehensive case-by-case assessment of zero-rating offers against a list of factors set out in its guidelines (including the likely effects of such offers on competition and end users).

A2.10 However, in September 2021, the Court of Justice of the European Union (CJEU) issued three rulings[40] that found that zero-rating offers by Vodafone and Telekom Deutschland in Germany were "contrary to the general obligation of equal traffic, without discrimination or interference, as required by the regulation on open internet access" and thus also incompatible with EU law.[41]

A2.11 In light of these rulings, BEREC consulted on updating its guidelines, culminating in a revised set of guidelines in June 2022.[42]

A2.12 As part of the update, BEREC confirmed that:

- there was still room for price differentiation when traffic is treated equally;
- "Any non-application-agnostic pricing practices are inadmissible", and that this would mean that ISPs would "need to cease their non-application-agnostic zero-rating practices";[43]
- examples of "typically admissible" commercial practices would include:
  - Application-agnostic offers where data consumption during a certain period (e.g. weekends) is not counted against the general data cap;
  - a lower quality tariff option selected by an end-user;
  - internet access service tariffs with different speeds, different volumes or for different user groups.

A2.13 Given BEREC's revised position, its guidelines no longer require NRAs to carry out case-by-case assessments of zero-rated offers.[44]

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[38] BEREC, 2022. *BEREC Opinion for the evaluation of the application of the Open Internet Regulation*, p. 3.
[39] European Commission, 2023. *Second report on the implementation of the Regulation on Open internet access*, p. 10.
[40] These relate to ECJ C-854/19 Vodafone (roaming), C-5/20 Vodafone (tethering) and C-34/20 Telekom Deutschland (throttling), 2 September 2021.
[41] CJEU, 2021. Press release: *'Zero tariff' options are contrary to the regulation on open internet access*.
[42] BEREC, 2022. *BEREC Guidelines on the Implementation of the Open Internet Regulation*.
[43] BEREC, *Update to the BEREC Guidelines on the Implementation of the Open Internet Regulation*, presented at public debriefing on the outcomes of the 51st BEREC ordinary meetings, 15 June 2022.
[44] BEREC, 2022. *BEREC Report on the outcome of the public consultation on the draft BEREC Guidelines on the Implementation of the Open Internet Regulation*.

A2.14 It should be noted that the UK is no longer obliged to take the CJEU's rulings on zero rated offers, or the BEREC Guidelines into account following its departure from the EU.

## Italy

A2.15 Some respondents to our 2021 Call for Evidence referenced the case between the global sports streaming provider, DAZN, and the Italian national regulatory authority, Autorità per le Garanzie nelle Comunicazioni (AGCOM) as a possible example of where a different approach to net neutrality has been taken and one that Ofcom might wish to look into further.

A2.16 However, in our view AGCOM's intervention in this case was not based on net neutrality considerations but rather mainly on network integrity and consumer protection grounds, as explained below. A summary of the case is provided below for completeness.

A2.17 On 26 March 2021, the Italian Premier League (Lega Serie A) announced it had assigned the two main packages of football rights for seasons 2021-2024 to DAZN in a deal reported to be worth €2.5bn, and which would make DAZN the largest broadcaster of Serie A matches. It was also announced on the same day that DAZN and the Italian telecoms company, Telecom Italia (TIM), had signed a distribution agreement that would see all the matches be shown on TIM's streaming platform.

A2.18 Following the awarding of the rights to DAZN, ISPs asked for AGCOM's intervention on issues relating to network capacity saturation due to the probable increase in traffic arising from DAZN live streaming these matches. AGCOM shared some of the concerns raised by operators about how the new arrangements could potentially adversely affect the functioning of the network. As a result, on 24 June 2021 AGCOM published its decision 206/21/CONS,[45] which set out measures aimed at avoiding network congestion relating to people watching the Serie A football matches online.[46]

A2.19 The decision stated that the measure had two purposes:

i) avoiding network congestion resulting from traffic peaks, which could occur as a result of the simultaneous transmission of one or more football matches; and
ii) preventing connection issues for subscribers and degradation of the quality of the internet access service for all users.

A2.20 According to decision 206/21/CONS, AGCOM stated that DAZN and network operators had to define and agree (prior to the start of the football season in August 2021) the "operating procedures for distributing traffic within their networks and for managing any malfunctions, using technical solutions based on the so-called CDN "Edge" Content Delivery Network), which make it possible to minimise the delay in the use of the content requested while preserving its quality".[47]

[45] AGCOM, 2021. *Delibera 206-21-CONS - Atto di indirizzo per il corretto dimensionamento e la dislocazione geografica della rete di distribuzione (CDN) delle partite di calcio di serie A per le stagioni 2021-2024 in live streaming.*
[46] AGCOM Comunicato Stampa, 2021. *Campionato di Serie A su DAZN, consiglio adotta atto di Indirizzo.*
[47] AGCOM, 2021. *Delibera 206-21-CONS - Atto di indirizzo per il corretto dimensionamento e la dislocazione geografica della rete di distribuzione (CDN) delle partite di calcio di serie A per le stagioni 2021-2024 in live streaming* (English translation by Ofcom).

A2.21 In particular, DAZN was required to provide ISPs with a national market share of more than 15% (i.e. Fastweb, Vodafone, WindTre) with storage and transmission equipment to be integrated into their transport networks (so called "DAZN Edge") in sufficient volume and geographic distribution to handle a substantial share of the overall DAZN-originated live streaming data traffic.[48] In addition, the use of multicast (whenever possible) was suggested in order to reduce the probability of network congestion.

A2.22 ISPs were also required to communicate to AGCOM the agreements reached with DAZN relating to the installation of DAZN Edge. AGCOM stated that it would monitor the agreements implemented and assess the impact on competition and on quality of service. AGCOM said that it would intervene with further decisions whenever necessary to protect users and the market.

A2.23 There are further AGCOM measures[49] relating to:

- **Public Interest**: given the popularity of football in Italy, AGCOM intervened on the back of constitutive law 481/95 which allows regulators to adopt binding decisions toward providers of services of public interest (e.g. energy, telephony, internet) in order to guarantee a minimum quality of service to customers and dispute resolutions and indemnities.
- **Definition of Quality of Experience parameters for dispute resolution**: this related to customer complaints relating to shortcomings in DAZN customer assistance and also quality of service issues (i.e. general difficulties in accessing the platform and poor picture resolution). For example, AGCOM has subsequently fixed the maximum buffering time when live-streaming matches, stipulated a maximum number of attempts that a customer should be able to access the platform as well as defining a minimum picture quality resolution.
- **Customer assistance**: these measures related to the fact that there was originally no facility for customers to call DAZN by telephone for technical help (i.e. only Chatbot/Live Chat functionality).

A2.24 Lastly, it should be noted that in December 2021, the Italian Government adopted the new Italian Audiovisual Media Services (AVMS) Code, transposing EU Directive No.2018/1808 into Italian law.[50] The Code asks AGCOM to define, for all public interest events (as defined by the Ministry of Economic Development), the necessary quality of service parameters and customer technical assistance procedures. As a result of this, AGCOM started proceedings in July 2022 (through decision 379/22/CONS[51]) to generalise what was determined for DAZN to other media live streaming providers that also distribute public interest events. It is expected that AGCOM will make its final decision in autumn 2023.

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[48] The number of caching servers required for ISPs with a market share of less than 15% was proportionately less.

[49] AGCOM, Delibera 334-21-CONS (10 October 2021); Delibera 17-22-CONS (20 January 2022); Delibera 232-DDA-22 (18 May 2022); Delibera 250/22/CONS (approved 5 July 2022).

[50] Directive (EU) 2018/1808 of the European Parliament and of the Council of 14 November 2018 amending Directive 2010/13/EU on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the provision of audiovisual media services (Audiovisual Media Services Directive) in view of changing market realities.

[51] AGCOM, 2022. *Delibera n. 379/22/CONS - Avvio di un procedimento e di una consultazione pubblica per la definizione di parametri di regolarità del servizio e qualità delle immagini, che devono essere assicurati dai fornitori di servizi media audiovisivi, ai sensi dell'articolo 33, comma 4, del decreto legislativo 8 novembre 2021, n. 208.*

# United States of America

A2.25 The topic of net neutrality has been a long-running issue in the United States. As it currently stands, there is no net neutrality framework at the federal level in place.

A2.26 A central component of the debate in the United States is less about the principles of net neutrality and more about whether ISPs should be classified under the Communications Act of 1934 as either Title I "information services"[52] or Title II "common carrier" services.[53] A classification under the latter would allow the Federal Communications Commission (FCC) to impose net neutrality rules and also give it the ability to regulate ISPs as if they were utilities and subject to price controls.

A2.27 Broadband has traditionally been classified as a Title I information service, and in May 2010, the FCC introduced strong net neutrality protections using Title I's section 706 of the Telecommunications Act of 1996 that prohibited ISPs from blocking websites or imposing limits on users. This set out three core net neutrality principles that apply to ISPs (i.e. transparency, no blocking, and no unreasonable discrimination) and in effect saw the FCC adopt its first-ever rules to regulate internet access. However, in January 2014 a Federal Appeals Court struck down the FCC's 2010 rules.[54]

A2.28 In 2015, through the '2015 Open Internet Order', the FCC decided to reclassify broadband as a common carrier Title II service as opposed to an information service. According to the FCC Chairman at the time, this would ban paid prioritisation, as well as prohibit the blocking and throttling of lawful content and services.[55] A change in the US administration led to the FCC repealing the order in 2017 and the FCC "returning to the traditional light-touch framework that was in place until 2015".[56]

A2.29 President Joe Biden has encouraged the FCC to "restore net neutrality rules undone by the prior administration".[57] On 26 September 2023, FCC Chairwoman Jessica Rosenworcel announced a proposal seeking to take the first procedural steps towards "re-establishing the FCC's oversight over broadband and restoring uniform, nationwide net neutrality rules" by largely returning to the rules that the FCC had adopted in 2015.[58] On 19 October 2023, the FCC voted in favour of initiating a new rulemaking process that could result in net neutrality rules being restored in the United States at the federal level. The FCC will now consult on its proposals, following which it is expected to issue a final rule on the reclassification of fixed

[52] Per 47 USC § 153(24), the term "information service" means "the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications […]".
[53] Per 47 USC § 153(11), the term "common carrier" means "any person engaged as a common carrier for hire, in interstate or foreign communication by wire or radio or interstate or foreign radio transmission of energy […]".
[54] US Court of Appeals for the District of Columbia Circuit, Verizon vs FCC, decided 14 January 2014.
[55] WIRED, 2015. *FCC Chairman Tom Wheeler: This Is How We Will Ensure Net Neutrality* [accessed 19 September 2023].
[56] FCC, December 2017. *FCC Takes Action to Restore Internet Freedom* [accessed 19 September 2023].
[57] The White House, July 2021. FACT SHEET: Executive Order on Promoting Competition in the American Economy [accessed 19 September 2023].
[58] FCC, September 2023. *FACT SHEET: FCC Chairwoman Rosenworcel Proposes to Restore Net Neutrality Rules* [accessed 27 September 2023].

and mobile broadband internet service as an essential telecommunications service under Title II of the Communications Act.[59]

## California

A2.30 In response to the FCC repealing the '2015 Open Internet Order', a number of states took legislative action to restore net neutrality rules in their jurisdiction. Most notably, California introduced its own net neutrality legislation (known as S.B. 822) in 2018.[60] The decision was challenged by four different ISP trade associations but their lawsuit was eventually abandoned in May 2022 after a series of adverse court rulings.[61]

# Singapore

A2.31 Singapore is deemed to have one of the world's most advanced telecoms markets with four main providers for a relatively small market, and high-performing metrics.[62]

A2.32 Singapore's position on net neutrality is set out in the June 2011 decision document of the Info-Communications Development Authority (IDA).[63] The IDA was superseded by the Infocomm Media Development Authority (IMDA) in 2016, but the current policy approach remains the same.

A2.33 ISPs are allowed to manage internet traffic based on commercial considerations so long as minimum Quality of Service (QoS) standards are fulfilled, legitimate internet content is not blocked, and ISPs continue to comply with IMDA's competition and interconnection rules.[64]

A2.34 The IDA/IMDA decision document summarises the policy position as follows:

| | |
|---|---|
| **No blocking of legitimate internet content** | • ISPs and telecom network operators are prohibited from blocking legitimate internet content.<br>• ISPs and telecom network operators cannot impose discriminatory practices, restrictions, charges or other measures which, while not outright blocking, will render any legitimate internet content effectively inaccessible or unusable. |
| **Comply with competition and interconnection rules** | • ISPs and telecom network operators must comply with IMDA's competition and interconnection rules in the Telecom Competition Code (TCC). |
| **Provide information transparency** | • ISPs and telecom network operators must comply with IMDA's information transparency requirement and disclose to end-users their network management |

[59] FCC, October 2023. *FCC to Start Proceeding on Reestablishing Open Internet Protections* [accessed 20 October 2023].
[60] SB-22 Communications: broadband Internet access service, date published 1 October 2018
[61] Ars Technica, May 2022. *Stung by 3 court losses, ISPs stop fighting California net neutrality law.* [accessed 19 September 2023]
[62] For example, it is ranked number two for fixed broadband speeds in the Ookla Speedtest Global Index in September 2023 (see: *Speedtest Global Index – Median Country Speeds September 2023).*
[63] IDA Singapore, 2011. *Decision issued by the Info-Communications Development Authority of Singapore, Net Neutrality*.
[64] Minimum quality of service standards can be found at www.imda.gov.sg/regulations-and-licensing-listing/ict-standards-and-quality-of-service/quality-of-service.

| | |
|---|---|
| | practices and typical internet broadband download speeds. |
| **Meet minimum QoS standards** | • ISPs must meet the minimum broadband QoS standards to ensure a reasonable broadband internet experience for end-users.<br>• Reasonable network management practices are allowed, provided that the minimum internet broadband QoS requirements are adhered to, and that such practices will not render any legitimate internet content effectively inaccessible or unusable. |
| **Niche or differentiated internet services allowed** | • ISPs and telecom network operators are allowed to offer niche or differentiated internet service offerings that meet IMDA's information transparency, minimum QoS and fair competition (including on interconnection) requirements. |

A2.35 The decision document clarifies that ISPs or network operators can offer specialised or customised internet content, Applications based on commercially negotiated arrangements or specialised terms and conditions. This has allowed ISPs and network operators to partner with over-the-top (OTT) service providers to offer add-on services for consumers without any degradation in user experience. As ISPs and network operators are allowed to offer specialised or customised plans to differentiate themselves from the competition, they are allowed, for example, to offer zero-rating plans.[65]

## South Korea

A2.36 In South Korea, the net neutrality framework consists of both guidelines (in place since 2011 and revised in 2020 to incorporate 5G network slicing) and "criteria for reasonable traffic management and transparency" (in place since 2013). These are administered by the Ministry of Science and ICT (MSIT). It should be noted that several of the provisions in the guidelines mirror those found in the existing UK and EU net neutrality frameworks.

A2.37 Services provided through the IP network are divided into internet access services and specialised services.

A2.38 A number of net neutrality principles exist for internet access services. These pertain to end user's rights, a prohibition of blocking, and unreasonable discrimination (e.g. throttling and paid prioritisation).[66] However, the latter two may not apply in cases where there is need for reasonable traffic management (with MSIT stipulating the principles of transparency, proportionality, non-discrimination and technical characteristics as the determining criteria). The criteria for reasonable traffic management and transparency include scenarios where action is required for the purposes of network security and stability and to protect the interests of most users from network congestion due, for example, to temporary network overload.

[65] For example, telecommunication providers may offer "unlimited data" for applications like Spotify or WhatsApp.

[66] ISP traffic management for commercial considerations is not explicitly prohibited by the net neutrality guidelines but MSIT has made it clear that traffic management of internet access services like paid prioritisation is a kind of unreasonable discrimination practice.

A2.39 ISPs are allowed to offer specialised services if a number of defined attributes are satisfied. As in the UK and the EU, specialised services shall not be provided for the purpose of circumventing the basic principle of net neutrality by substituting for internet access services.

A2.40 Zero-rating is an example of an acceptable commercial consideration in South Korea, and it is not prohibited as it not deemed to be technical discrimination of traffic. However, regulators are able to intervene if zero-rating is suspected to be anti-competitive using a case-by-case approach.

A2.41 Complementary to the net neutrality guidelines, MSIT conducts QoS evaluations once a year on the wired and wireless internet services of the major telecommunications companies. MSIT has informed us that the evaluation results to date have been found to be satisfactory with respect to overall performance.

## Netflix and South Korea Broadband dispute

A2.42 A legal dispute in South Korea between Netflix and a local ISP, SK Broadband, began in 2020. In South Korea, privately negotiated bilateral commercial contracts are commonplace between content providers and ISPs relating to network access. The fees are not regulated (but are typically determined by bandwidth or traffic volume). Different content providers have different arrangements with ISPs. Netflix claimed that such arrangements violated the principles of net neutrality and that there was no basis for the network usage fee that was being demanded by SK Broadband.

A2.43 Due to the popularity of Netflix in South Korea, SK Broadband claimed that it had been necessary to expand the international leased line between the Netflix server in Japan (which had been the main route for traffic delivery) and SK Broadband's local network in order to accommodate the increase in usage and traffic resulting from customers using Netflix.

A2.44 SK Broadband requested that Netflix bear the cost of the international leased line service that was built exclusively to serve Netflix traffic. SK Broadband's argument was that since Netflix was using SK Broadband's resources to connect to its network, Netflix was obligated to pay for it. In response, Netflix proposed that SK Broadband install a cache server known as Open Connect Alliance (OCA) that would reduce the amount of traffic that SK Broadband would have to carry over its leased international submarine cables. However, this proposal was rejected by SK Broadband.

A2.45 SK Broadband requested negotiation arbitration to the Korea Communications Commission (KCC) in November 2019 with respect to its network use contract discussions with Netflix.[67] In response, Netflix filed a lawsuit against SK Broadband in April 2020 stating that it had no obligation to pay for network use as this violated net neutrality principles, and that peering beneficial to both parties should not entail network usage fees. However, according to South Korean commentary on the guidelines on net neutrality, because SK Broadband was not

[67] It is our understanding that in this case KCC was focused on whether any anti-competitive issues had arisen during the negotiation process between SK Broadband and Netflix. If such issues were found, then KCC would have the authority to recommend a remedy to correct the issue.

blocking or unreasonably discriminating against Netflix's service traffic, it was not violating the net neutrality guidelines.[68]

A2.46 Netflix's case against paying network usage fees was dismissed in a District Court judgement in June 2021. The Court found that because Netflix's traffic was carried on a separate international submarine line, there was economic value for the connection and so Netflix had an obligation to bear the cost of using the network, stating that "it needs to be determined by negotiations between the parties involved whether or not some fees will be paid".[69] The Court found that there was no relationship between the paid for transport and net neutrality.

A2.47 In September 2023, in the midst of a second trial at the Seoul High Court, it was announced via a press release that Netflix, SK Broadband and SK Telecom (parent company of SK Broadband) had ended their legal dispute and had instead agreed a "strategic partnership to provide better entertainment experiences to their customers".[70] However, the specific terms of the partnership have not been disclosed and so the nature of any agreement (be it technical or commercial) with respect to the original dispute are unknown.

[68] MSIT and Korea Information Society Development Institute (KISDI), December 2021. *Understanding Net Neutrality Policy (Commentary on the "Guidelines on Net Neutrality and Internet Traffic Management")* , pp. 39-40.

[69] Tech Crunch, June 2021. *Korean court sides against Netflix, opening door for streaming bandwidth fees from ISPs* [accessed 19 September 2022].

[70] Netflix, 2023. *SK Telecom, SK Broadband & Netflix Establish Strategic Partnership to Enhance Customers' Entertainment Experience* [accessed 19 September 2023].

# A3. Data traffic and costs

## Introduction

A3.1 In this annex, we look at recent trends in traffic volumes and peaks, evidence on network costs, and information on mobile customers' data usage. This provides important inputs to our review. In particular, it informs our assessment in Sections 6 and 11 of the impact, if any, that restrictions due to the net neutrality rules may have on how ISPs manage traffic and invest in capacity efficiently, and on mobile ISPs' ability to manage excessive data usage.

## Data gathering

A3.2 For our 2022 Consultation, we issued formal information requests to the largest fixed and mobile ISPs in the UK, a broad range of content providers, as well as a small number of Content Delivery Network (CDN) providers.[71] After the 2022 Consultation, we issued further formal information requests to fixed and mobile ISPs in the UK, content providers, and a small number of CDN providers.[72]

A3.3 Across these requests, we asked for information on the volumes and throughput of UK data traffic, how this traffic is distributed, managed and monitored by ISPs, content providers and CDNs and the costs involved in these activities.

A3.4 For ISPs, we asked for data broken down by different parts of their network (i.e. backhaul, core, etc.). We use core data below, except where indicated.

A3.5 We also asked for information on the level and distribution of data usage of UK mobile customers and mobile data usage associated with customers using SIMs in fixed wireless routers or tethering.

A3.6 We have used the responses to our requests to inform the analysis below and in other sections in this document. We have also used other Ofcom research to inform our thinking, such as the Communications Market Report.[73]

## Traffic volumes

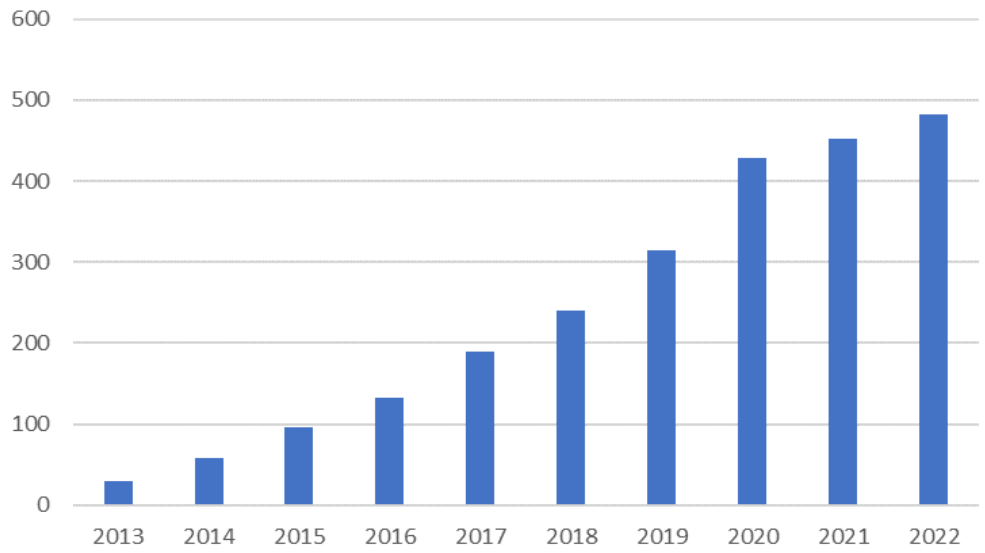
### Overall traffic volumes are expected to continue to increase significantly

A3.7 Data traffic volumes across fixed and mobile ISPs continue to increase significantly each year. Trends in our Communications Market Report suggest the average year on year growth

[71] We asked for data from fixed and mobile ISPs (BT Group, TalkTalk, Sky, Virgin Media O2, Vodafone, and Three), content providers (Netflix, Amazon (UK), BBC, ITV, Meta, Microsoft, Google) and third party CDN providers (Amazon Web Services, Akamai).
[72] We asked for data from fixed and mobile ISPs (BT Group, TalkTalk, Sky, Virgin Media O2, Vodafone, and Three), content providers (Netflix, Amazon (UK), BBC, ITV) and third party CDN providers (Akamai, Lumen).
[73] Ofcom, 2023. *Communications Market Report*.

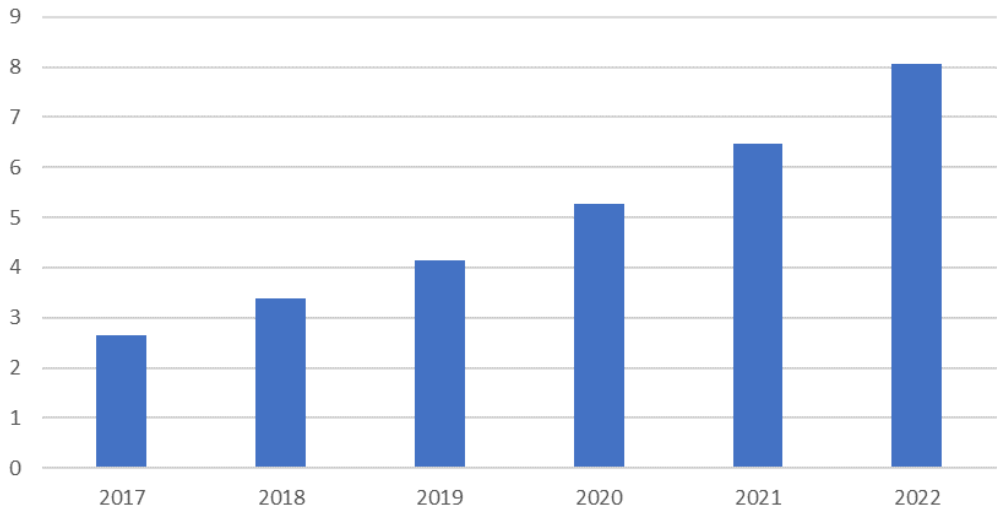
of data used over the period 2013 to 2022 was 38% for the average fixed broadband customer, and over the period 2017-2022 was 25% for the average mobile data customer.[74]

**Figure A3.1: Average fixed broadband data use per month per subscription (GB)**




*Source: Communications Market Report*[75]

**Figure A3.2: Average mobile data use per month for data users per subscription (GB)**




*Source: Communications Market Report*[76]

A3.8 Both fixed and mobile ISPs suggested that traffic will continue to grow in future with the streaming of popular sports as a key driver of this. Some fixed ISPs identified other factors, including seasonal trends, migration of television from digital terrestrial television (DTT) to IP

[74] We set out in more detail our expectations for future mobile demand in a discussion paper published earlier this year. A medium growth scenario assumes a continuation of recent historical growth with 40% year on year growth for mobile data to 2035. Ofcom, 2022. *Mobile networks and spectrum: Meeting future demand for mobile data*.

[75] Ofcom, 2023. *Communications Market Report*, Interactive Data.

[76] Ofcom, 2023. *Communications Market Report*, Interactive Data.

delivery, increase in the number of connected devices, and the emergence of the metaverse(s) as other drivers of increased traffic in the future.

A3.9 Although growth rates are significant, they have been fairly consistent over the last ten years. We note that future demand projections are inherently uncertain and future trends could have a significant impact on demand. In particular, the migration of TV from DTT to IP delivery is currently uncertain, including in terms of timescales and how this traffic will be delivered. However, we currently do not see any strong reasons to expect that growth rates will increase in the period up to 2030, compared to growth rates over the last decade.

## Traffic patterns

### Traffic demand tends to peak daily in the evening and annually in December

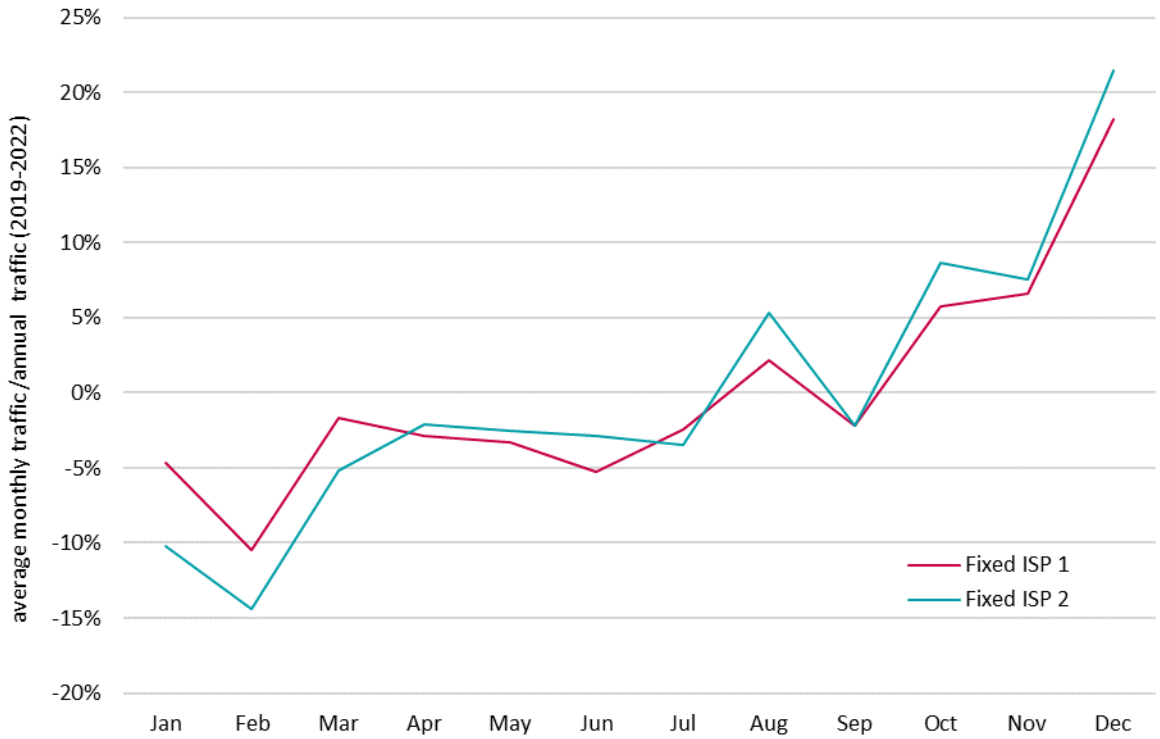
A3.10 Understanding the pattern and variation of traffic through the day and across the year is important for traffic management and network planning purposes.

A3.11 Traffic demand tends to peak daily in the evening (around 8pm) when residential consumers have more time to access and use popular services and the traffic in this busy hour has also grown.

A3.12 Figure A3.3 illustrates a typical seasonality profile of traffic data in the backhaul network for two fixed ISPs.[77] We estimated the profile shown in the graph by firstly determining the ratio of traffic in a month over the average monthly traffic for that year, and secondly, estimating an average ratio over the years 2019-2022. The annual traffic growth rates outlined above of ~30% p.a. mean that traffic is increasing significantly through the year and so demand in December tends to have the highest monthly traffic.[78]

[77] For mobile ISPs, seasonal traffic profile is similar to that shown in Figure A3.3 for fixed but with occasional peaks spread throughout other times of the year as well.
[78] We note traffic was high in January 2021 due to strict lockdown conditions.

**Figure A3.3: Average seasonal traffic profile across the years 2019-2022 for two fixed ISPs [✂]**




*Source: Ofcom analysis from RFI data*[79]

## Traffic peaks

A3.13 We asked ISPs to identify the top ten traffic peaks in each of the last four years on their networks.[80] There were some limitations to the data that we received.[81]

A3.14 In some cases, ISPs were able to identify specific events that coincided with the top peaks on their networks.[82] Where events and the associated content provider could be identified[83] (which was for 139 peaks out of the 330 peaks reported), the livestreaming of football was a big driver (115 peaks, or 83% of peaks that could be identified).[84] A number of peaks (20) were identified as relating to the 2022 World Cup (14% of the total peaks over the period where the event and content provider could be identified),[85] and a fifth of these peaks (4 out

[79] [✂], and [✂].
[80] In our RFI, we asked the ISPs to provide, for each year of January 2019-January 2023, the top ten highest traffic peaks. We asked for the date, time and traffic throughput of the peak. These top 10 peaks for each ISP are used in the analysis above.
[81] Some ISPs were unable to identify traffic peaks in the backhaul domain [✂], one was only able to identify some of the peaks [✂], and others were not able to identify the service driving the peaks – [✂]. Also, there were some ISPs that could sometimes identify the service driving the peak, but not in each instance [✂]. Therefore, we have focused on data from the core domain, which is more complete.
[82] While there will be many different sources of traffic on the network, these events tend to generate the significant volumes of traffic that lead to top peaks.
[83] ISPs were better able to identify the events when reporting traffic on their core networks, and less able in relation to backhaul networks.
[84] An additional 28 of the 330 peaks were identified as football related but the specific content provider showing the football was not identified. As such, the number of peaks associated with football will be greater than the number of peaks where the content provider and event was identified.
[85] The majority of these peaks occurred on mobile networks (16 out of 20).

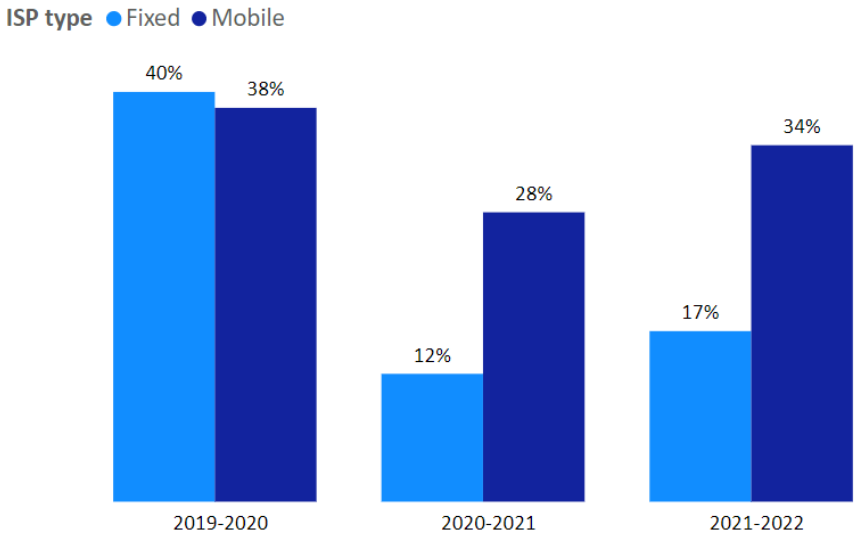
of 20) occurred at the same time as a software or gaming update. Peaks were less frequently due to gaming downloads (such as launches of a popular game title[86]) and peaks were only very rarely caused by a gaming download on its own.[87] 34 peaks out of 139 peaks (where a driver could be identified) related to gaming downloads (24%). We note that over half of the peaks that were associated with gaming downloads or launches (18 out of 34) occurred at the same time as another event such as livestreaming football or other game downloads/launches.

A3.15 Some events (or types of events) led to peaks across most or all ISPs. Traffic from Amazon was identified as the single largest driver of traffic peaks,[88] causing 82 out of the 139 top peaks where the event and content provider were identified (59%). Out of these 82 peaks, Amazon traffic was solely identified for 76 of them, and for the other 6 peaks, Amazon traffic alongside gaming related traffic were identified as the cause of the peaks.

A3.16 However, some events only impacted a single ISP. For example, BT Sport was associated with 7 peaks on BT's network, but none on others.[89]

A3.17 Responses indicated that the magnitude of top peaks in fixed and mobile core networks have continued to grow over the last three years. For fixed networks, the average increase was 40% from 2019-20, 12% from 2020-21, and 17% from 2021-22. For mobile networks, the average increase was 38% from 2019-20, 28% from 2020-21, and 34% from 2021-22.[90]

**Figure A3.4: Growth in the magnitude of top peaks**




*Source: Ofcom analysis based on RFI data*

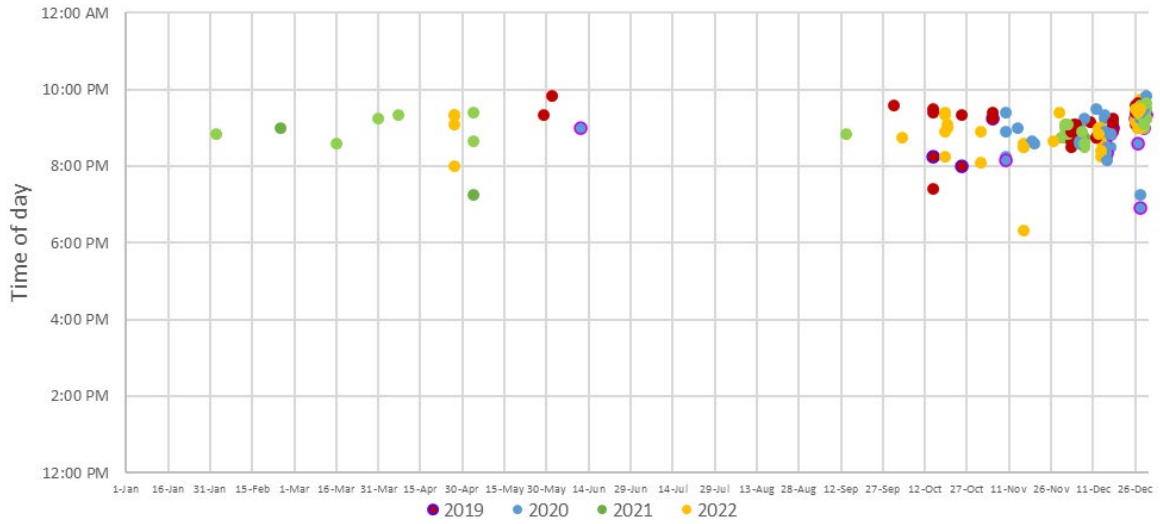
[86] These launches or updates came from a range of gaming titles including, Call of Duty, Apex Legends, Red Dead Redemption 2 and Fortnite.
[87] We note that we have not seen evidence to suggest gaming peaks have become more or less frequent over the four-year period. In addition, the data indicates that top peaks which have gaming downloads as a reported driver are less frequent for mobile than fixed ISPs.
[88] We note that ISPs [✂]. Therefore, Amazon traffic will also be attributable to its own CDN, which will be carrying both Amazon and other content providers' traffic. This traffic will include live Premier League football on Amazon Prime, a key driver of traffic peaks.
[89] We note that access to BT Sport via ISPs other than BT is limited.
[90] We note that [✂].

A3.18 These top peaks were most likely to occur in the evening, with 95% of fixed and 85% of mobile peaks occurring between 8-10pm. However, there was a wider distribution of peaks for mobile, with a larger portion occurring earlier in the day.[91]

A3.19 They were also more likely to occur towards the end of the year. For fixed, 88% of peaks occurred between October and December, with 67% of the peaks occurring in December. For mobile, 71% of peaks occurred in the last few months of the year, with 39% occurring in December.[92]

A3.20 Figures A3.5 and A3.6 below show the distribution of peaks by time of day and when they occurred during the year for fixed and mobile ISPs.

**Figure A3.5: Timing of Top 10 peaks by year – Fixed ISPs**

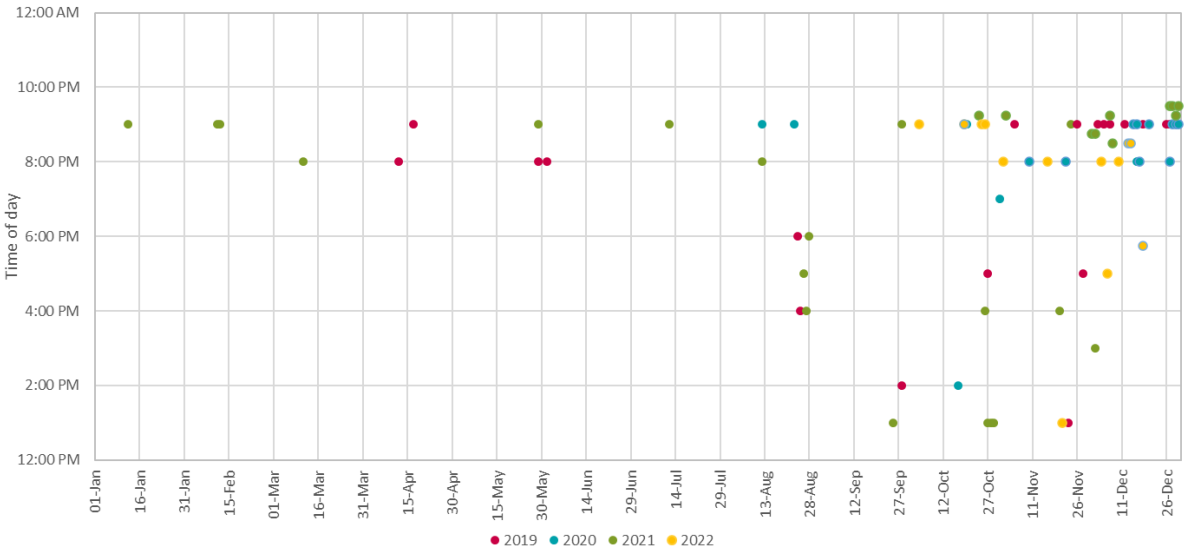



*Source: Ofcom analysis based on RFI*

[91] For example, 5% of mobile peaks occurred between 1-2pm, and 10% of mobile peaks occurred between 4-5pm.

[92] We note that the proportion of peaks occurring at different times of the year has changed relative to the 2022 Consultation due to the inclusion of data from more recent time periods. We consider that the exact timing and distribution of peaks in a given year will depend, to some extent, on the timing of sporting and other events (which may differ from year-to-year).

**Figure A3.6: Timing of Top 10 peaks by year – Mobile ISPs[93]**




*Source: Ofcom analysis based on RFI*

A3.21 When considering future capacity requirements, ISPs need to consider not only average busy hour traffic but also the scale of peaks above this. The higher the traffic delivered during these peaks, the more capacity ISPs may need to build for very occasional use.[94]

A3.22 We have examined the relationship between traffic delivered during the top ten traffic peaks identified by ISPs in a year over the average busy hour throughput, to examine the extent to which the traffic is becoming peakier. The data available to us indicates that the ratio of peak to average busy traffic has not been increasing (and has actually slightly reduced).[95]

A3.23 This indicates that while top traffic peaks are getting larger in overall terms as reported above, they have been growing at the same, or slightly lower rate than average busy hour throughput. Nonetheless, even where this ratio decreases, the overall traffic volumes are larger overall (meaning that ISPs need to continue to add additional capacity).

## Network capacity and the impact of traffic peaks on networks

### In general, networks have been built to handle peaks so there has been only limited impact on quality of service

A3.24 Networks have been built to carry peak traffic. ISPs in general forecast this peak based on the traffic throughput experienced in the busy hour (i.e. evenings, as shown above) and project forwards. They may also include adjustments for expected events that could alter these volumes (such as forecasted growth in IP delivery of TV content).

[93] Note that data from some Mobile ISPs peaks was not always provided at a sufficiently granular level to be included in this chart. No peaks occurred outside the time periods shown in this graph.
[94] It is also likely that it is more difficult to forecast these peaks which occur relatively infrequently.
[95] We concluded this by comparing ISP throughput data for peaks against the busy hour in the month, where available. We requested the relevant data from a number of ISPs, but not all ISPs were able to provide data or provide it in a comparable way.

A3.25 Based on data submitted by both fixed and mobile ISPs, we found very few instances where traffic peaks had been close to full utilisation of network capacity.[96]

A3.26 Some ISPs did measure aspects of how the peaks affected their networks. Some of those ISPs observed slight increases in latency, jitter, and downstream congestion, while others had to carry traffic on infrastructure normally used to provide resilience. This would mean packet loss would be likely to occur if the peak coincided with a failure in part of their network. One ISP [✂][97] observed slight increases in latency, jitter and congestion during some of the top ten peaks on its network. Another ISP, [✂][98] explained that it did not capture the effects on latency and jitter, but it did measure the proportion of traffic carried on infrastructure suffering packet loss and the proportion of traffic carried on non-resilient infrastructure (i.e. would suffer traffic loss at peak under failure). This evidence supplied does not indicate that the impact of peaks changed significantly over the period 2019 to 2021.

A3.27 Some ISPs noted that the top peaks had not resulted in any impact on performance, due to how they dimension their networks. [✂][99] noted that network capacity is managed with the aim of mitigating any congestion in advance via upgrades and traffic management. [✂][100] noted that it has been able to manage peaks by dimensioning the network to be much greater than required for average traffic delivered in the busy hour, although the peaks do have an impact on network resilience, which puts the network at risk of not being able to maintain full load.

A3.28 Other ISPs noted that they did not record, track or monitor the impact of traffic peaks on their networks and/or had no evidence of these events affecting their network.[101]

# Network costs

## To date, traffic growth has been met with investment in networks

### Fixed ISPs

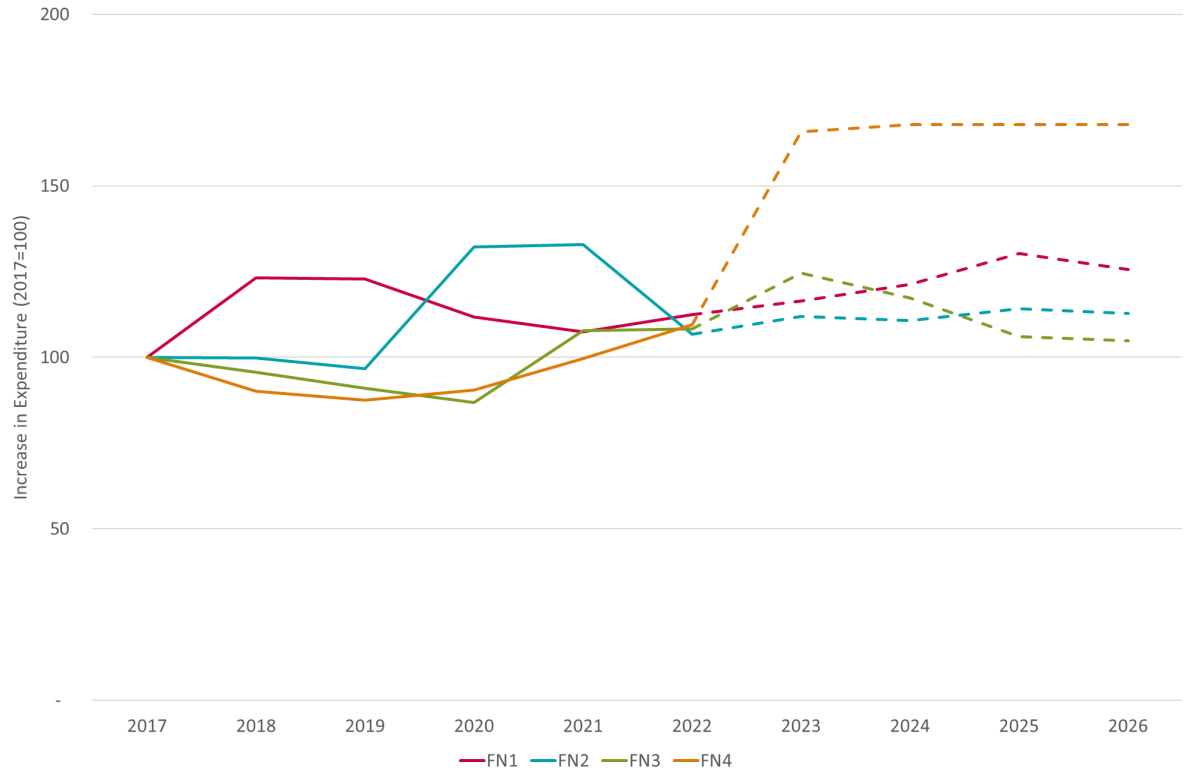
A3.29 Fixed core and backhaul network expenditure has been broadly consistent over time and is projected to remain so. The average expenditure by the five largest ISPs over the period 2017-2022 was approximately £[✂]m per year, and the average forecasted expenditure by the five largest ISPs over the period 2023-2026 is approximately £[✂]m per year.[102] A relatively consistent level of total expenditure by the five largest ISPs has been achieved, and is projected to continue, despite the high year on year growth in traffic volumes outlined

[96] As a proxy, we looked at where the peaks reached over 95% of the networks built capacity. The built capacity was an estimate provided by each ISP of the peak throughput in bits per second their network was built to carry. We found that over the 37 month period, there were only a small number of instances where ISPs reached this level. For example, [✂].
[97] [✂].
[98] [✂].
[99] [✂].
[100] [✂].
[101] For instance [✂].
[102] This is both capex and opex and covers [✂].

above. This implies significant levels of unit cost decreases in network capacity investments.[103]

A3.30 Figure A3.7 shows that most fixed ISPs are forecasting for expenditure to continue at a broadly similar level, with one ISP expecting a step change in expenditure.

**Figure A3.7: Change in nominal expenditure levels (capex and opex) for 4 major fixed ISPs since 2017**



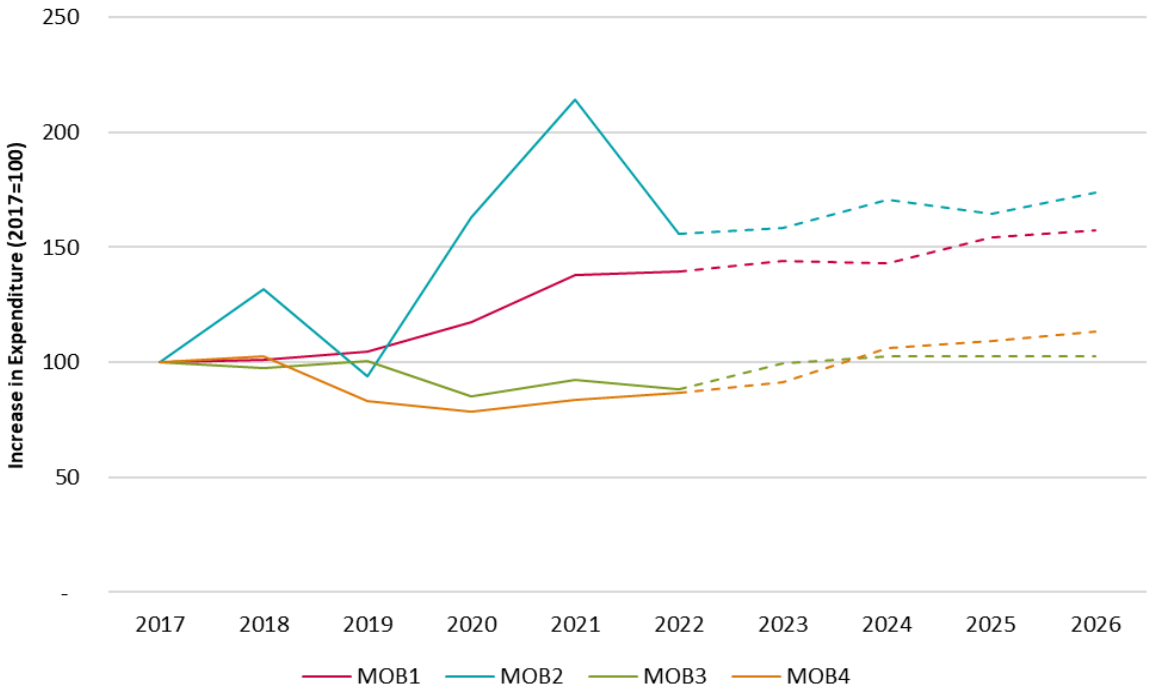

*Source: Ofcom analysis based on RFI*[104]

## Mobile ISPs

A3.31 MNO network expenditure has been increasing and is forecast to increase. Overall forecast expenditure appears to be growing over the period with average expenditure per mobile network per year at around £[✂]m over the period 2017-2022, increasing to over £[✂]m over the period 2023 to 2026.[105] These increases are not consistent across MNOs, with two MNOs making relatively small actual and projected increases in expenditure over the period 2017-2026 and two MNOs making larger actual and projected increases in expenditure over the same period.

[103] Unit costs here refer to costs of equipment per unit of traffic.
[104] Note that one ISP is missing from this chart compared to the historical data as they were not able to provide a full forecast over the time period. Data from [✂].
[105] Average expenditure here is given in nominal terms.

**Figure A3.8: Change in nominal expenditure levels (capex and opex) for 4 major mobile networks since 2017**




*Source: Ofcom analysis based on RFI*[106]

## Investment in and use of CDNs and caching helps meet the demand on networks

A3.32 Larger content providers have also been making investments to help deliver traffic more efficiently to ensure a good quality experience for users. For example, by avoiding using parts of the core and IP interconnect network, they can lower the network cost to the ISP of delivering data traffic.[107]

A3.33 Information from content providers shows a diverse approach to investment in traffic delivery technologies, with the main areas of expenditure in caches hosted in the ISP network, caches hosted in shared data centres, and payments to third party CDNs to host and deliver traffic.[108]

A3.34 UK based investments made by each large content provider can vary significantly but they tend to have an order of magnitude of about £[✂]m to [✂]m per year.[109]

**Figure A3.9: Spending by content providers on UK traffic delivery methods in 2021**[110] **[✂]**

*Source: Ofcom analysis based on RFI*[111]

[106] RFI data from [✂].
[107] For example a BT report from 2018 outlined how "Caching content deeper in the network offloads c 60% of core capacity".
[108] See, Section 3, paragraphs 3.18-3.21.
[109] [✂].
[110] Note that this graph only includes direct infrastructure expenditure related to delivery of content in UK networks. I.e. it does not include research and development costs of ABR technology or infrastructure operations.
[111] [✂].

A3.35 Some content providers have also suggested that they made significant investments in codec and adaptive bit rate technology, that enables traffic to be delivered more efficiently.[112]

A3.36 For example, Netflix suggested that between 2015 and 2020, Netflix investment in codec technology has halved the amount of bits needed to carry a film or series of the same video quality.[113]

A3.37 Some content providers also noted that they make significant investment in research and development globally to improve technology related to content delivery networks. For example:

- [✂]:
- [✂].[114]
- [✂].[115]
- [✂].[116]

A3.38 Several content providers appear to be increasing investments in their own network infrastructure more generally to improve the quality of their content to the end user. For example, Microsoft, Meta and Google are investing in subsea cables to allow them to deliver content closer to the end user on their own networks rather than via other providers' networks.[117]

A3.39 The use of CDNs (either owned by content providers or 3rd parties) can also provide some incentive to a content provider to manage traffic flows efficiently. Content providers may wish to reduce traffic at peak times to limit the required investment in CDN infrastructure or avoid peak-based charging from 3rd party CDNs.[118]

A3.40 The extent to which content providers use transit, peering (both public and private), caching, and multicast[119], may also have an impact on content provider and ISP costs. Based on data from the main ISPs and largest content providers, over the period 2019-21, on-net caching and private peering were used for the distribution of most traffic and transit and public peering volumes are relatively small. The percentage of traffic delivered by each method has been relatively consistent over that time.

A3.41 The data suggests that on average for the major ISPs, just over 50% of all traffic is delivered via on-net caches, just under 40% via private peering, about 4% via public peering and about

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[112] BBC response to the 2021 Call for Evidence, paragraph 17; ITV Response to the 2021 Call for Evidence, pp. 2-3. Meetings with [✂].
[113] Netflix response dated 15 May April 2022 to the RFI dated 17 March 2022, p. 5.
[114] [✂].
[115] [✂].
[116] [✂].
[117] See for example: https://news.microsoft.com/features/microsoft-facebook-telxius-complete-highest-capacity-subsea-cable-cross-atlantic/ and https://cloud.google.com/blog/products/infrastructure/learn-about-googles-subsea-cables.
[118] For example, the BBC response to the 2021 Call for Evidence, para 11 notes that "content providers currently incur material distribution costs, e.g. through peering, transit and/or CDN charges. These are all elements of the value chain which content providers control. These costs incentivise content providers to distribute their content as efficiently as possible and allow them to make best value decisions in these areas".
[119] We note that we received little insight into the use of multicast, as most ISPs do not use it and BT Group was not able to provide the data as requested.

7% via IP transit.[120] Traffic delivered via caches in data centres is likely to make up most of the traffic delivered via private peering.

## Traffic demand could become 'peakier' in the future

A3.42 While ISPs have generally coped well with peak demands to date, there are potential reasons why the 'peakiness' of demand may start increasing in future years. In particular, a move to IP distribution for broadcast TV over the coming years could potentially lead to higher peaks relative to average traffic demand. Increases in live sporting events delivered over IP could cause significant peaks on ISPs networks. [✂].[121] Also, as set out in Section 3, new services may also begin to emerge that require additional capacity (and in some cases may have other specific quality of service requirements) leading to greater demands on networks, and a wider variety of demands from consumers of their internet services. It is possible that the usage patterns of these services could further compound the 'peakiness' of traffic.

## Specialised services

A3.43 We also sought to understand the volume of traffic delivered by specialised services[122], as it is informative to understand the current materiality of these volumes.

A3.44 A small number of ISPs were able to provide estimates or figures of their specialised service traffic. The estimates that we received suggest that specialised service traffic is in most cases[123] a very small proportion of overall traffic volumes. [✂].[124]

A3.45 Some ISPs were unable to provide this information. [✂],[125] [✂][126] and [✂].[127] Others ([✂[128],])[129] commented that they did not provide specialised services, and therefore could not provide any traffic data.

## Mobile data usage

A3.46 We gathered further information from mobile ISPs to understand the nature of the data usage patterns by mobile customers. Specifically, we requested from mobile ISPs data on the distribution of data usage by mobile customers, data on use of SIMs intended for mobile handsets in fixed wireless routers, and data on tethering.

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[120] RFI data from fixed and mobile ISPs.
[121] BT Group response to the 2021 Call for Evidence, p. 4.
[122] See Section 2 for a description of specialised services.
[123] One area where we were not able to obtain information was BT's multicast volumes. It is reasonable to assume these volumes could be more material.
[124] [✂].
[125] [✂].
[126] [✂].
[127] [✂].
[128] [✂].
[129] [✂].

## Distribution of data usage by mobile customers

A3.47 We asked mobile ISPs for information on how their customers' data usage is distributed. Table A3.10 shows the proportion of data consumed by different groups of customers as a percentage of all retail mobile customers. For all MNOs, customers that use the most data make up a notably disproportionate share of overall data usage on the mobile network. The top 1% of mobile customers in terms of data usage account for around [✂([✂]) of the data usage by all mobile customers on the network, while the top 10% customers account for [✂] ([✂]) of the data usage.

**Table A3.10: Proportion of data consumed by customers**

| | Customers with unlimited allowance | Data usage by customers in Top 10% | Data usage by customers in Top 1% |
|---|---|---|---|
| BT/EE | [✂] | [✂] | [✂] |
| Three | [✂] | [✂] | [✂] |
| O2 | [✂] | [✂] | [✂] |
| Virgin Mobile | [✂] | [✂] | [✂] |
| Vodafone | [✂] | [✂] | [✂] |

*Source: Ofcom analysis of RFI data averaged over data for July-Dec 2022*[130]

A3.48 We also reviewed data on the level of monthly usage of retail mobile customers. Data in Table A3.11 shows that while most customers use very little data, a small proportion of customers consume a very high level of mobile data. Notably for all mobile ISPs, the usage of the vast majority of mobile customers ([✂]), including customers with unlimited data allowance, is well below the data allowance of ISPs' most generous limited data tariffs.[131] [✂].

**Table A3.11: Monthly data usage by customer at different percentiles, December 2022 (GB/month)**

| | Median | Top 10% | Top 1% | Top 0.1% | *Max data allowance of limited tariff* |
|---|---|---|---|---|---|
| **BT/EE** | [✂] | [✂] | [✂] | [✂] | *150* |
| **Three**[132] | [✂] | [✂] | [✂] | [✂] | *250* |
| **O2** | [✂] | [✂] | [✂] | [✂] | *250* |
| **Virgin Mobile**[133] | [✂] | [✂] | [✂] | [✂] | *NA*[134] |
| **Vodafone** | [✂] | [✂] | [✂] | [✂] | *200* |

[130] BT Group, Virgin Media O2, Vodafone, and Three's responses to the RFIs dated 18 April 2023; [✂].
[131] [✂]
[132] [✂]
[133] [✂]
[134] Virgin Mobile are moving to O2, see Virgin Mobile website.

*Source: Ofcom analysis of RFI data* and ISP's websites[135]

A3.49 As a cross-check, we also analysed a sample of July 2021 customer-level data provided by mobile ISPs, which shows the same picture – a very small minority of customers on mobile networks accounts for a large share of the total mobile data usage.[136]

## Router use

A3.50 We asked mobile ISPs for data on the share of mobile customers who used SIMs intended for mobile phones in routers. Only two out of the four MNOs were able to provide us with this data.[137] As shown in Table A3.12, the data consumption by customers that use SIMs in routers account for a limited proportion of data usage by all mobile customers, [✂].

A3.51 This is in contrast to the larger proportion (around [✂]) of data usage accounted for by the top 1% of customers in terms of usage overall, as shown in Table A3.10. In addition, the average usage of the identified router users is also lower compared to the average usage of the top 1% customers.

A3.52 Table A3.12 also shows that based on the evidence available, only a small proportion of the top 1% heaviest mobile data users are identified as router users.

A3.53 Therefore, based on the evidence available, it does not appear the case that router use is the key driver of high or excessive data usage.

**Table A3.12: Share of router usage, December 2022**

| | Share of all customers (no. subscriptions) | Share of all customers (data usage) | Share of top 1% customers identified as using routers (no. subscriptions) |
|---|---|---|---|
| **[✂]** | [✂] | [✂] | [✂] |
| **[✂][138]** | **[✂]** | **[✂]** | **[✂]** |

*Source: Ofcom analysis of RFI data*[139]

[135] Customer data usage based on [✂]. Maximum data allowance of each ISP's limited data tariffs based on ISP's websites in September 2023: EE website accessed on 22 September 2023; O2 website accessed on 22 September 2023; Vodafone website accessed on 22 September 2023; Three website accessed on 22 September 2023.

[136] Based on Ofcom analysis of customer level data received following the Request for Information sent on 25 July 2022, from BT Group, Sky, Tesco Mobile, Three, Virgin Media O2, Vodafone. Analysis of the customer-level data is expected to be published later this year.

[137] [✂.]

[138] [✂.]

[139] [✂]; [✂].

# A4. Discussion of the economics of allowing ISPs to charge content providers

## Introduction

A4.1 In Section 11, we outline the main arguments raised in response to our 2022 Consultation in relation to allowing ISPs to charge content providers for delivering or prioritising their traffic to end users across their networks.

A4.2 We have concluded that while in principle there could be benefits to a charging regime in the UK, particularly in incentivising content providers to deliver traffic more efficiently, we recognise the difficulties that designing an effective scheme raises, the risks, and uncertainty such a change could create, and the unclear impact on consumers. We conclude that we have not seen sufficient evidence that a charging regime would support our objectives.

A4.3 The economic benefits and drawbacks of a charging regime have been discussed as part of a wider international debate. This longstanding debate has recently regained particular momentum in Europe, with large European ISPs calling for a "fair and proportionate contribution" from content providers to ISPs network usage costs.[140] In February 2023, the European Commission launched an exploratory consultation seeking the views of market participants on the future of the electronic communication sector and its infrastructure, including a section on "fair contribution by all digital players"[141] and in October 2023 it published a summary of the responses received (for further details see Section 11).

A4.4 During this time, several market participants have commented on this topic, as have academic researchers, regulators, and economic consulting firms. However, their conclusions are often polarised, with some concluding that there is a strong economic argument for a charging regime, and others concluding that the costs would outweigh the benefits. In this annex we summarise the main economic arguments raised by academics and consultants with regards to a charging regime. We review the analysis they have conducted, examining the specific factors they choose to incorporate in their analysis and the assumptions they adopt, and explain how these choices lead to these diverging conclusions.

A4.5 Although we have reviewed several publications discussing this subject, we focus our discussion in this annex on three specific articles which we believe illustrate the main arguments raised in favour and against charging over the past few years. These are:

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[140] See, for instance, the proposal presented by ETNO (the European Telecommunication Network Operators' association, which includes BT amongst its members as well as many other large European ISPs) to mandate large content providers to negotiate with ISPs a fair and proportionate contribution to ISPs network usage costs proportional to costs associated with the traffic these content providers generate. ETNO, 18 July 2022. *Joint EU and National telecom sector statement on "fair contribution",* and Axon Partners Group, May 2022. *Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators.*

[141] European Commission, 23 February 2023. *Exploratory Consultation – The future of the electronic communications sector and its infrastructure.*

i) **'Proposals for a levy on online content application providers to fund network operators'**:[142] A report from Oxera commissioned by the Dutch Ministry of Economic Affairs and Climate, which finds that charging cannot robustly be shown to increase economic efficiency or consumer welfare and would potentially bring substantial transaction and set-up costs. The report argues that charging would lead to transfers from content providers to ISPs, which could potentially promote network investments, but this is not an economically sound reason to institute a network fee as there are more effective ways of achieving such goals.

ii) **'Fair cost sharing: big tech vs telcos'***:*[143] A working academic paper by B. Jullien and M. Bouvard from the Toulouse School of Economics,[144] which presents a simplified theoretical economic model showing that charging content providers a volume-based fee will force them to internalise the effect of their content quality decisions on network costs and thus incentivise them to deliver traffic more efficiently. It finds that charging will have a positive impact on consumer welfare, especially in the case of content providers that are particularly efficient at monetising the presence of users via advertisement revenues.

iii) **'Another look at the Debate on the "Fair Share" Proposal'**: [145] An article written by D. Condorelli, J. Padilla, and Z. Vasas at Compass Lexecon,[146] which argues that, in the absence of charging, ISPs do not have the ability nor the incentive to undertake the investments needed to meet the growing demand for data, as they do not internalise the entire benefits arising from their investments. The article proposes to solve this market failure by mandating ISPs and content providers to negotiate a fair and proportionate contribution that content providers should pay, with the backstop of arbitration. This contribution could either be a lump-sum payment (which they claim would not result in higher prices for content) or a per-unit traffic fee (which would be easier to calculate but would result in higher prices for content). In either case, the article claims that the investments funded by the network fees charged to content providers would improve broadband quality and thus lead to lower quality-adjusted broadband prices (better broadband quality for the same price) and likely lower quality-adjusted content prices (same or higher content prices but delivered over higher broadband quality),[147] thereby increasing consumer welfare.

A4.6 In the remainder of this annex, we discuss the key economic arguments underlying the impact of a charging regime on (i) efficiency; (ii) transfers and distributional effects; and (iii) investments in the ISPs' networks. Under each heading, we summarise some of the key insights from economic theory, before discussing the approach and, in particular, the considerations which we believe are included or excluded from the papers reviewed.

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[142] Oxera, 30 January 2023. *Proposals for a levy on online content application providers to fund network operators: An economic assessment prepared for the Dutch Ministry of Economic Affairs and Climate*.

[143] Bruno Jullien and Matthieu Bouvard, October 2022, revised March 2023. *Fair cost sharing: big tech vs telcos*, TSE Working Paper, n. 22-1376.

[144] The authors flag that this research has benefited from the financial support of Orange in the context of the research foundation TSE-Partnership.

[145] Daniele Condorelli, Jorge Padilla, and Zita Vasas at Compass Lexecon, 7 May 2023. *Another Look at the Debate on the 'Fair Share' Proposal – An Economic Viewpoint*.

[146] The authors flag that this report was prepared at the request of Telefonica.

[147] Which is assumed to matter more to consumers than content prices.

# Impacts on efficiency

A4.7 In economics, there are two relevant concepts of efficiency in a market: allocative efficiency and productive efficiency:

i) allocative efficiency occurs when there is an optimal distribution of goods and services meeting the needs and preferences of all market participants; and
ii) productive efficiency occurs when the market uses its resources efficiently and cannot improve the production of goods or services any further given the constraints of current technology – i.e. output is maximised for a given level of resources.

A4.8 We assess the impact of a charging regime on both types of efficiencies in turn, considering in each case to what extent the papers under review take account of these impacts.

## Allocative efficiency: two-sided markets and cross-group externalities

A4.9 ISPs play a central role in the relationship between content providers and consumer:

- Consumers are interested in both broadband access from ISPs and content provided by content providers and they consume these two products together (in other words, broadband access and content are complementary products, adding value to each other in the eyes of consumers). However, consumers want access to ISPs' broadband largely to use and consume the content provided by content providers.
- Content providers vary a lot in size, purpose, and business model but all can only offer their content to consumers by delivering it via the ISP's network. Some of the largest content providers are audio-visual content providers and they are usually subscription-based or ad-funded (or licence-fee funded in the case of the BBC), which means that their revenues will generally be higher if more consumers can view their content.[148]

A4.10 Because of these dynamics, some respondents to our 2022 Consultation (e.g. BT, Three, and Vodafone), as well as other commentators (e.g. Oxera's report), argued that the environment in which ISPs, content providers, and end-users interact should be characterised as a two-sided market.

A4.11 Two-sided markets typically consist of a service or multiple services connecting two or more groups of users who are mutually dependent upon each other, such that the utility of the users in one group depends on the number and type of users in the other group. The impact that a group of users has on the utility of users in the other group is referred to as cross-group externality and can be either positive or negative, symmetric or asymmetric. For instance, a commercial ad-funded website can be considered as a two-sided platform bringing together both viewers and advertisers, where the value to advertisers is positively affected by the presence of more users, but users are generally negatively affected by the presence of more advertisers on a given website.

[148] We note that the success of other types of content providers, such as government websites or online shopping websites, will also generally depend on the number of consumers they are able to reach online.

A4.12 The relative strength of the cross-group externalities between users affects the optimal pricing charged by the platform to each group of users. If a group of users on one side of the platform benefits from the presence of users on the other side much more than the benefit occurring in the opposite direction, it would be allocatively efficient for the former group to subsidise the latter (for example, through one-sided pricing rather than two-sided). For example, certain magazines and newspapers curate the articles, and sometimes even the ads, included in their publications and charge fees to both readers and advertisers, while others carry relatively less personalised content and more ads and offer readers copies for free (and thus are only compensated by advertisers).

A4.13 In their response to our 2022 Consultation, both Three and Vodafone argue that the net neutrality regime artificially distorts the two-sided structure of this market by *de facto* requiring ISPs to only charge end-users and not content providers. However, we note that it is not necessary to define the relationship between ISPs, content providers, and end-users as a two-sided market to argue that charging would have a positive welfare effect, nor that a two-sided market framework automatically implies that charging would improve consumer welfare.

A4.14 The three articles under review have made different assumptions concerning the structure and dynamics of the relevant markets for broadband and online content, driven by different research focuses. It is important to understand how they differ from one another:

- Oxera's report assumes that ISPs operate as a two-sided market, where the value of the ISPs' network for content providers depends on the number of consumers connected to it and consumers gain more value out of an ISP network the more content is available at greater quality. However, its model calculates that there are no significant efficiency gains to be unlocked by allowing ISPs to charge both sides of the market.
- Compass Lexecon's article argues that the complementary nature of broadband and content implies that ISPs' investments generate positive cross-group externalities on the demand for content, and therefore that only a charging regime would compensate ISPs for the entire positive effect generated by their investments and incentivise them to invest more in their networks.
- Finally, the paper by Jullien and Bouvard does not focus on allocative efficiency, and therefore does not explicitly mention a two-sided market framework or cross-group externalities between ISPs and content providers.

A4.15 In our conclusion we explain how whilst these three articles shed light on aspects of the likely impacts of a charging regime on efficiency, given the different research focuses and assumptions made none of these articles can provide a definitive conclusion as to the impact of a charging regime on efficiency in the UK.

## Productive efficiency: efficient use of networks

A4.16 ISPs arguing in favour of a charging regime also claim that content providers have a significant ability to affect efficient network utilisation, but that they have no incentives to deliver traffic efficiently, if they are not charged based on the volume of traffic they deliver. This affects both *when* most of the traffic is delivered (with peaks, for instance, during the evening) as well as *how* the traffic is delivered (for instance, whether content providers adopt bandwidth conservation tools such as adaptive bit rates or better encoding techniques, distribute traffic via CDNs embedded in the ISPs' networks, use peering, or use multicasting). A charging regime with volume-based charges could, in principle, increase

content providers' incentives to moderate traffic, and thus lead to fewer congestion peaks and higher network resilience, thereby improving the quality of broadband access for consumers.

A4.17 As an overarching point, we note that end-users drive the majority of traffic rather than content providers, and that ISPs are able to influence all traffic on their networks (whereas content providers can only influence the actions of their own users). As such, ISPs are likely to be better placed than content providers to influence the timing of customer usage (see Section 11). Notwithstanding this, where content providers can improve the efficiency of delivery, we note that only certain charging structures will be effective in incentivising efficient delivery of traffic. For instance, a per-unit fee will incentivise content providers to adopt more efficient bandwidth conservation tools to decrease their impact on ISPs' networks at all times, while a peak-based fee would push content providers to reduce peak traffic or shift it to off-peak times to directly avoid congestion. However, both of these alternatives could be more costly for an ISP to implement (compared to, say, a lump-sum payment) as they would require ISPs to introduce ways to identify and monitor traffic from each content provider (a cost that might not be bearable for smaller ISPs). As a general observation, it will always be important to identify the market failure that needs to be addressed in order to design the optimal charging structure in any given market.

A4.18 The working paper by Jullien and Bouvard at the Toulouse School of Economics analyses this aspect and shows that charging content providers with a volume-based fee will incentivise them to moderate traffic. However, we note that the relative improvement in efficient use of the network produced by this model relies on the assumptions that it is the content provider that generates the traffic (and not the end-user), and, absent any charging, content providers have no incentive to optimise traffic and instead maximise their traffic consumption to increase the quality with which their content is distributed to end customers (and thus the demand for their products). In this model, it is only under a charging regime that content providers start optimising traffic delivery and therefore the productive efficiency benefits delivered by charging correspond to the entire ability of content providers to influence effective network utilisation.

A4.19 As discussed in Section 11, this is not consistent with the behaviour of several content providers observed in the UK, who spend or invest significantly in embedded CDNs and content encoding absent charging in order to provide a good customer experience. The extent of the benefits that a charging regime could deliver to UK consumers in terms of fewer congestion peaks and higher network resilience will therefore depend on what content providers could do to further improve their delivery efficiency that they are not already doing, given consumer demand for certain types of traffic at certain times may be outside their control (see discussion below).

A4.20 We also note that there are alternative ways to enable and encourage efficient traffic delivery without mandating content providers to pay a network fee to ISPs. These include the possibility for ISPs to undertake reasonable traffic management according to different categories of traffic based on their technical characteristics, to sell differentiated retail offers to customers with different levels of quality of service (or reflective of the consumer traffic usage and the congestion it induces), or to provide specialised services. Our statement sets out our conclusions on these areas.

A4.21 While the paper by Jullien and Bouvard studies the impact of charging on network efficiencies, neither Oxera's report or Compass Lexecon's article incorporate this aspect in their research.

## Transfers and distributional effects

A4.22 Depending on the structure adopted for network fees (e.g. whether flat or volume based fees were used), charging will generate transfers from content providers to ISPs and affect the prices charged by ISPs and content providers to end customers.

A4.23 As discussed in Section 11, if content providers were charged a network fee, particularly one based on the content providers' specific traffic volumes, they would observe an increase in their costs and likely would have to pass through at least a portion of this fee to end customers in the form of higher subscription prices. Their ability and incentive to do so would vary based on various market characteristics (notably the extent of competition in the relevant market) and also on their business model, i.e. their primary source of funding. Content providers that charge consumers directly (e.g. Video on Demand platforms or videogames developers) are likely to directly increase their retail prices. Content providers who currently do not charge any fee to consumers and are instead funded by advertisement (e.g. Google's free version of YouTube or most social media platforms) would either have to start charging a fee (or increase the number of subscribers) or increase the number of ads on their platform, which could harm end customers. Public Service Broadcasters, in particular the licence-fee funded BBC, could face trade-offs between funding content and paying for distributing that content.

A4.24 The impact on ISPs' broadband prices will depend on the specific structure of the charging regime. Any regime that will redistribute at least part of the network fees to ISPs will likely lead to lower broadband prices, as ISPs will observe an increase in their gross margins allowing them to compete more fiercely amongst each other ('water-bed effect'). In addition, if the distribution of funds collected via network fees is based on the number of users served by each ISP, ISPs might be more incentivised to lower broadband prices to attract users previously served by other ISPs in order to receive a bigger share of the network fees contributions.

A4.25 The impact of these transfers on consumer welfare will depend on the relative size of the two effects described above (higher content prices and lower broadband prices), which in turn will be determined by the characteristics of the broadband and content markets, such as the intensity of competition of the markets for access and content, the business model of content providers (whether they are funded by subscription fees, ads, or TV licence fees), the magnitude of the network fees, or the adopted network fees structure. In addition, the responsiveness of consumers' demand for broadband to consumers' demand for content (and vice versa) will also impact how ISPs and content providers will adapt their prices.

A4.26 As discussed in Section 11, determining how these different effects will interact with each other and what will be the overall outcome on consumer welfare is complex. Accordingly, the academic papers have only been able to study the impact of transfers by considering only one or two of these effects in isolation, and the exclusion of other relevant effects and mechanism from consideration implies that they cannot offer a definitive prediction of the overall impact of a charging regime on consumer welfare.

A4.27 For instance, the theoretical model described in Jullien and Bouvard's working paper assumes that content providers agree to pay a volume-based network fee to ISPs and that the broadband and content markets are each controlled by a rational profit-maximising monopolist. The focus of Jullien and Bouvard's paper is to study how different content providers' business models influence the nature and size of these transfers. In particular, the paper focusses on the rise in the "nuisance" to content customers (either in terms of subscription prices or advertisement volumes) and therefore the impact on consumer welfare in response to the introduction of a volume-based fee by ISPs. They find that content providers (and especially those particularly efficient at monetising the presence of users on their platforms via advertisement revenues) will choose not to increase the nuisance to their customers by the equivalent of the full network fee to limit the number of consumers who will turn away from their content, therefore limiting their loss of advertising revenues.

A4.28 In this highly simplified model, consumers will face lower broadband prices and only a little more nuisance to view content providers' content and therefore will benefit from the charging regime. This is a specific example of our general observation in Section 11 that, the greater the market power that content providers enjoy in the content market, the more likely a charging regime is to increase consumer welfare. However, the paper does not consider other relevant factors, such as how the level of competition in the broadband and content markets will influence, and by how much, the extent to which ISPs and content providers will be able to change their prices. Therefore, while it provides insight into one aspect of the transfers that could arise from a charging regime, its conclusions are not fully representative of what would happen in reality.

A4.29 Oxera's report sets up a basic empirical model to assess the impact of charging on social welfare, relying on actual data on prices, volumes, and costs from ISPs and content providers, as well as research by Frontier Economics estimating the cost of the incremental traffic generated by large content providers.[149] In the main version, the model calculates that the net outcome of charging on broadband and content prices will not lead to significant welfare gains (it estimates an overall change of between -0.08% and +0.38% in consumer surplus and companies' profit as a percentage of initial ISPs revenues depending on the assumed transfers).

A4.30 This empirical model is highly simplified, but it does include numerical assumptions for most of the market characteristics that impact the size of the transfers between ISPs, content providers, and consumers (such as those listed in paragraph A4.25 above and in Section 11), and therefore allows the calculation of the change in consumer surplus and companies' profit under a charging regime. The appendix of the report calculates the impact of a charging regime under different assumptions relating to ISP and content provider margins, the content provider's business model, and the sensitivity of broadband and content demand to prices. However, as noted directly by Oxera, it is important to caveat that the report does not take into account any indirect and longer-term effects of charging such as higher incentives to invest or innovate in the ISPs' network or content markets (where impacts would be very difficult to quantify), and therefore it can only describe a partial picture of the impact of a charging regime.

[149] Frontier Economics, 7 April 2022. *Estimating OTT traffic-related costs on European Telecommunications Networks – A report for Deutsche Telekom, Orange, Telefonica and Vodafone*.

A4.31 Compass Lexecon's article does not incorporate any of the market characteristics listed above in paragraph  in its theoretical economic model, but describes qualitatively how the structure of the adopted charging regime could affect broadband and content prices, and thereby consumer welfare. In particular, the article argues that:

- If content providers were to pay a lump sum payment contingent on ISPs' network investments, the network charge would not affect content providers' and ISPs' variable costs and operating margins, and therefore prices for both broadband and content would remain unaffected in absolute terms. However, due to the improvement in broadband quality generated by the investments, broadband prices would fall in quality-adjusted terms (better broadband quality for the same price).
- If content providers were to pay per-unit traffic fees to ISPs directly (which would be easier to negotiate between the parties), the network charge would affect content providers' and ISPs' variable costs and operating margins, and therefore broadband prices would fall and content prices would increase in absolute terms. However, the article argues that the net effect on consumer welfare would likely still be positive as it assumes that the demand for content is less reactive to changes in price compared to the demand for broadband, and, in any case quality-adjusted content prices might fall due to increases in broadband quality following the ISPs' investments (same or higher content prices but delivered over higher broadband quality, which consumers are assumed to value more than price).

A4.32 This conclusion relies heavily on the assumptions listed above, for which the article does not provide any evidence or justification.[150] Should these strong assumptions not be representative of actual consumers' behaviour, then the conclusion of the article claiming that a charging regime would undoubtedly have a positive impact on consumer welfare would no longer hold.

## Investments in the ISPs' networks

A4.33 The ISPs arguing in favour of a charging regime all highlight the increase in consumption of data traffic over the past few years, which is expected to continue in the future. These ISPs claim that they are investing substantially to expand network capacity, but that a contribution from content providers (and particularly large content providers who account for a large share of network traffic) will be necessary to guarantee that the network infrastructure will continue to be sufficient to meet future demand for data, and therefore enhance consumer welfare.[151]

A4.34 We note that there is a very close link between the impact that charging can have on investments in ISPs' networks and the dynamics discussed above regarding the market

[150] For instance, we note that it is a strong assumption that demand for content is less reactive to changes in price than the demand for broadband. This would imply that the proportion of consumers who, when facing higher content prices, would reduce their content consumption (e.g. switch to a cheaper Netflix subscription plan) is less than the proportion of consumers who, when facing higher broadband prices, would reduce their broadband consumption (e.g. switch to a cheaper data plan with slower or limited internet traffic).
[151] The research conducted by Axon on behalf of ETNO attempts to provides an indicative estimate of the order of magnitude of the contribution that ISPs expect to collect from content providers via network fees, and they find that is an annual contribution of €20 billion per year from large content providers, split between deployment of 5G (60%) and FTTH (40%).

allocative efficiency and transfers between ISPs, content providers, and end consumers. Indeed, ISPs will have to choose whether to use the funds collected via charging to lower broadband prices, invest in their networks, or provide returns to investors. As argued in Oxera's report, corporate finance and economic theory suggests that ISPs will only choose to invest more if the expected returns to investors from these investments exceed the cost of capital.[152] As such, the level of investment in network infrastructure as a result of introducing charging is unclear and would depend on a number of factors.

A4.35 The relationship between allocative efficiency and network investments is the focus of Compass Lexecon's article, which considers the benefits that ISPs' and content providers' investments generate on each other's revenues. The article concludes that under Net Neutrality rules, ISPs do not have the incentive to undertake all the investments needed to meet the growing demand for data. They argue that this is because ISPs are not fully compensated for the positive impact that their investments generate in terms of demand for content providers' content and the resulting higher returns for content providers. They acknowledge that content providers also invest in improving content quality and efficient traffic delivery, which has positive impacts on the demand for ISPs' broadband, but they claim that the benefits generated by ISPs investments are greater. This is based on assumptions that (i) ISPs' investments can improve broadband quality more than content providers' investments, (ii) the demand for content is relatively more reactive to changes in broadband speed and reliability than the demand for broadband, and (iii) ISPs' profits are relatively lower than the profits declared by large content providers such as Alphabet, Meta, or Netflix.

A4.36 The article concludes that government intervention is needed to mandate ISPs and content providers to agree on a fair contribution that content providers should make to ISPs' investments, instituting a mandatory arbitration system in case the negotiations stall. However, we note that this conclusion relies heavily on the specific assumptions made in the article. While assumption (i) above appears intuitively plausible and there is some evidence in support of (iii), at least for several large content providers,[153] the article does not provide any evidence or justification for assumption (ii) in particular.

A4.37 Finally, we note that setting up a charging regime that aims to deliver more efficient traffic delivery and enhance consumer welfare such as a volume-based or peak-based fee, as discussed in the previous sections, might have undesired consequences on network investments and average quality of networks, as also described in Oxera's report. For instance, if content providers had to pay a congestion charge, that is a per-unit fee when the

[152] Oxera's report claims that the additional funds available to ISPs via the charging regime alone will not incentivise them to invest more. The report cites an empirical study which finds that the relationship between cash flow (and thus the availability of internal funds) and firms investment decisions is near zero, which Oxera claims is consistent with the observation of telecom regulators that ISPs capex have been unaffected by fluctuations in cash flow or other financial indicators. Chen, H. J. and Chen, S. J., 2012. *Investment-cash flow sensitivity cannot be a good measure of financial constraints: Evidence from the time series*, Journal of Financial Economics, 103:2, pp. 393–410.

[153] For instance, the CMA estimated that Return on Capital Employed ('ROCE'), that is the accounting profits compared to the investment made to achieve these profits, achieved globally by Google Search and Facebook in 2018 was respectively likely to be well over 40% and 51%, compared to a Weighted Average Cost of Capital ('WACC') of around 9%. CMA, 2019 - *Online platforms and digital advertising market study, Appendix D*, paragraphs 139 and 140. By comparison, Ofcom estimated that the ROCE of MNOs in 2018 varied between 23% for EE and -2% for Vodafone (12.7% on average), compared to the industry average WACC of 7.8%. Ofcom, 2022. *Mobile Markets Review – Ofcom's future approach to mobile markets*.

network is particularly congested, ISPs could be incentivised to under-invest in network capacity to cause congestion and thus collect more network fees. Alternatively, if the charging regime allowed ISPs to create two traffic channels (a paid high quality fast lane and a free slower lane), they would have an incentive to not invest in adequately preserving the free slower lane, letting it become a "dirt road", to persuade more content providers to pay for the fast lane.

## Concluding remarks

A4.38 As highlighted in the introduction to this annex, the question of whether ISPs should be allowed to charge content providers has been part of a very lively public debate over many years. Several articles and reports have been written on this topic, but their conclusions on whether charging would benefit consumers and the wider market often appear contradictory. However, we believe that these diverging conclusions are the result of different assumptions adopted in these articles relating to the key effects of charging, that is market efficiency, transfers and distributional effects, and investments in ISPs' networks, as summarised below and in Table A4.1.

A4.39 Oxera's report presents an illustrative static economic model to describe a two-sided market in which ISPs, content providers, and consumers interact. It tests this model with data on prices, costs, and sales of ISPs and content providers and finds that charging would not lead to significant gains for consumers. While the model sheds light on how different market characteristics would affect the impact of a charging regime on consumer welfare and industry profits, it is important to note Oxera's own caveat that their model does not include any consideration of investments in ISPs' networks, of the efficient use of traffic delivery by content providers, and of other dynamic welfare effects, and therefore can only offer a partial picture. The report also qualitatively describes several concerns arising from the implementation of a charging regime, such as the increased transaction costs and need for regulatory intervention, the potential competitive distortions in the market, and the risk of degradation of internet quality for consumers, which in our opinion are all valid concerns.

A4.40 Due to the uncertain effect on consumer welfare calculated in the first part of the report and the long list of risks and concerns described in the second part, Oxera concludes that, even if charging could promote investments in ISPs' networks, it is not the most economically effective way to achieve such a goal.

A4.41 The working academic paper by Jullien and Bouvard assumes that charging would improve both the productive and the allocative efficiency of the market and therefore finds that it would have a positive effect on consumer welfare. In the theoretical economic model presented in this paper, content providers have no incentive to optimise their use of ISPs' networks (and instead maximise their traffic consumption to increase the quality with which their content is distributed to end customers) until they are charged a volume-based fee which forces them to internalise the effect of their content quality decisions on ISPs' network costs. As noted above, in reality it is not necessarily the content provider generating the demand (this is more likely to come from the end-user), and the observation that content providers have no incentives to use ISPs' networks efficiently is not consistent with the behaviour of many content providers.

A4.42 The paper argues that ISPs will reduce broadband prices while content providers (especially those content providers who can efficiently monetise the presence of consumers on their

platform) will not pass on to consumers the full increase in prices or advertisements, therefore leading to a more beneficial outcome for end consumers. However, the paper does not consider how the extent of competition in the broadband and content markets will affect how likely ISPs and content providers are to change their prices in response to a charging regime.

A4.43 The article written by Compass Lexecon focuses on the relationship between allocative efficiency and network investments. It argues that ISPs do not have the incentive to undertake the investments needed to meet the growing demand for data because, absent any charging, they do not internalise the positive externality that their investments generate on content providers revenues. The article relies heavily on a few restrictive assumptions in relation to how ISPs, content providers, and consumers would react to changes in broadband and content prices, as well as broadband quality, in supporting its finding that a charging regime would benefit consumers and increase investments in ISPs' networks.

**Table A4.1: Different treatment of key economic arguments in the papers under review**

| | Oxera | Jullien-Bouvard | Compass Lexecon |
|---|---|---|---|
| **Allocative efficiency: two-sided markets and cross-group externalities** | ISPs operate as two-sided platforms, but no significant gains to be unlocked by allowing ISPs to charge both sides of the market | Not included | No two-sided market framework, but positive cross-group externalities from investments on both sides |
| **Productive efficiency: efficient use of the network** | Not included | Per-unit traffic fees would incentivise content providers to moderate traffic (compared to no charging) | Not included |
| **Transfers and distributional effect** | Empirical model that calculates how the impact of charging changes based on different assumptions on transfers, ISPs and content providers' margins, content provider's business model, and the sensitivity of broadband and content demand to prices. | Theoretical model that studies how different content providers' business models influence the nature and size of transfers. | Only qualitative description of effect of charging structure on transfers and consumer welfare. |

| | Oxera | Jullien-Bouvard | Compass Lexecon |
|---|---|---|---|
| **Investments in the ISPs' networks** | Only qualitative description of potential undesired consequences of charging on network investments and average quality of network. | Not included | Only allowing ISPs to charge content providers would ensure that ISPs are fully compensated for the positive cross-group externalities their investments generate on demand for content providers' content, resulting in higher ISP incentives to invest. |
| **Overall impact of charging on welfare** | **No significant increase in economic efficiency, and potential substantial transaction and set-up costs** | **Positive impact, especially in the case of content providers that are particularly efficient at monetising the presence of users via advertisement revenues** | **Positive effect in case of lump-sum investment-contingent payments (but harder to negotiate between ISPs and content providers), likely positive effect in case of per-unit traffic fees** |

A4.44 Overall, we believe that all three articles shed light on aspects of the likely impacts of a charging regime and are therefore useful tools to help policy makers think through some of the important issues. However, none of these articles can provide a definitive conclusion as to the merits of introducing a charging regime in a particular jurisdiction, due to the exclusion of relevant considerations, the reliance on strong assumptions for which, in many cases, no empirical justification is provided, and, perhaps most importantly, due to the fact that the specific weight given to particular considerations is likely to change according to the market in question and the design of any charging regime.

A4.45 We believe that any conclusion on the merits of introducing a charging regime in a specific market context should instead be based on specific evidence regarding the strength of each of these effects in the particular markets affected. In Section 11, we present the results of our assessment of the strength of each of the effects described in this annex in the UK markets, based on the evidence we collected during this review.

# A5. Consumer research

## Context

A5.1 In this annex, we present the results of consumer research, looking at how consumers use the internet, their views on internet usage, and their experience, including the internet access services they use and the prices they pay for them.

## Research

A5.2 To inform our views, in late 2021/early 2022 we conducted qualitative research among residential and small and medium enterprise (SME) users of the internet to explore their experiences of using the internet and attitudes towards the principles of net neutrality. We also conducted quantitative research among UK SMEs[154] that included some questions around net neutrality as well as experience of using the internet. [155] These pieces of research are referred to in the following paragraphs as 'qualitative research'[156] and 'SME quantitative research'.

### Consumer behaviour and views

A5.3 We set out below our findings on the importance of broadband to residential and SME users, and how satisfied consumers are generally with their broadband services.

#### Small and medium enterprises (SME) findings

A5.4 The SME quantitative research shows how SMEs are reliant on the internet. Of the SMEs in the research, 94% of them said they had a form of internet connectivity, and the majority (70%) used a fixed-line broadband service and 23% accessed the internet via a mobile network. Half who used a mobile network and approaching two-thirds (62%) who used a fixed network said that service (respectively) is "absolutely vital". [157] Around two fifths (39%) of SMEs said, "The business would not be able to operate" without it, and a further 36% said losing it would have "quite a big impact". [158] The recent pandemic increased reliance on internet services, with 41% of mobile internet consumers, and 31% of fixed internet consumers saying internet services had become more important since the pandemic. [159]

A5.5 SMEs in the qualitative research indicated that they strongly valued reliability. It found that SMEs were less tolerant than residential users of broadband failures, as this could lose them time and customers and have a direct impact on their businesses. In order to get a very stable and high-quality connection and/or faster services, some SMEs had invested in business contracts for fixed or mobile internet access. SMEs were also more demanding than

[154] In total this involved 2,109 respondents.
[155] Ofcom, 2022. *SME consumer experience in the communications market*. Subsequent references are to this publication.
[156] Oxygen, 2022. *Qualitative Research Report on Net Neutrality*. Subsequent references are to this publication.
[157] This compares to just over a quarter (27%) of users of fixed landline services.
[158] Just 3% said it would have "no impact" on their business, and 6% said they don't use the internet.
[159] Ofcom, 2022. *SME consumer experience in the communications market*, report pp. 50-53.

residential users, when it came to service standards, securing value for money or obtaining redress/refunds.[160]

## Residential findings

A5.6 The internet is a core part of most peoples' lives in the UK. Ofcom research shows that 94% of adults accessed the internet in 2021.[161] On average UK adults spend almost four hours online a day, of which three hours are spent on smartphones.[162]

A5.7 The vast majority of households in the UK have access to both a fixed and mobile internet connection. According to our 2023 Technology Tracker, most households have access to fixed broadband and over 9 out of 10 adults have access to a smartphone with a 4G or 5G connection.[163] Therefore, we expect that both fixed and mobile ISPs will continue to be important channels for consumers to access content.[164]

A5.8 In our qualitative research, all respondents claimed great reliance on both their fixed and mobile broadband. For fixed broadband, residential consumers reported that a good in-home or in-premises connection was an expectation, as so much of what people needed to do was now online. The mobile internet was similarly essential, as an important access point to everything online and potential backup for their fixed service. [165] Younger respondents were more reliant on mobile internet services than older respondents.[166]

A5.9 In general, the majority of residential respondents noted that typically problems connecting to the internet were infrequent or minor. A minority had a lot of problems connecting to the internet and noted that these problems were significant and important to them.[167]

A5.10 Respondents noted some of the problems they had encountered with their internet service. For fixed consumers, this included buffering, freezing of streams, time delays on gaming, intermittent disconnections, slow loading of content or evening slowdowns. For mobile internet consumers, some noted problems with the slow loading of content, mobile data blackspots or being unable to call or message other people or connect to the internet.

[160] Oxygen, 2022. *Qualitative Research Report on Net Neutrality*, p. 46.
[161] Ofcom, 2022. *Online Nation 2022 Report*, p. 10.
[162] Ofcom, 2022. *Online Nation 2022 Report*, p. 12.
[163] 94% of households have fixed broadband internet access. 92% of adults have access to a smartphone with a 4G or 5G connection. Bespoke analysis from our 2023 Technology Tracker Main Data Tables.
[164] We note that our qualitative consumer research found that some people tethered their laptop or tablet to their mobile inside the home when their broadband connection was slow or unavailable and outside the home when they wanted to ensure they had a secure connection or did not want to use public Wi-Fi. Some who had unlimited/large amounts of data on their mobile, continued to use mobile data in-home, rather than switch to Wi-Fi on their fixed broadband. During lockdown, when people were spending more time than usual at home, this habit had led to some running out of data on their mobile.
[165] Oxygen, 2022. *Qualitative Research Report on Net Neutrality*, p. 15.
[166] Oxygen, 2022. *Qualitative Research Report on Net Neutrality*, p. 16.
[167] Oxygen, 2022. *Qualitative Research Report on Net Neutrality*, pp. 18-19.

# A6. Glossary and abbreviations

**Access network**: The 'last mile' segment of a network, which connects users to their service provider's network infrastructure. This includes both fixed and radio access networks.

**the Act**: The Communications Act 2003.

**Adaptive bitrate (ABR)**: A method to improve the quality of video streaming. It adjusts the quality of the stream to better suit the user's bandwidth and device capacity.

**Backhaul network**: The aggregation layer of a network, which connects a service provider's access network to its core network.

**BEREC**: The Body of European Regulators for Electronic Communications.

**Busy hour**: The 60-minute period during which a communications network is at its busiest.

**Content distribution network** (CDN): A geographically distributed network of servers, which is used to distribute content and applications produced by content providers.

**Core network**: The central part of a network where users' traffic is routed/switched.

**Datacentre**: Premises whose main purpose is to house computing, data and application hosting, and communications equipment.

**Geoblocking**: A technology that restricts access to internet content based on a user's location.

**GC**: A General Condition imposed by Ofcom under section 45 of the Communications Act 2003.

**Internet protocol** (IP): Packet data protocol used for routing and carriage of messages across the internet and other modern communications networks.

**IP Interconnection**: The physical and logical link between two IP networks.

**IP transit**: A wholesale connectivity service that provides indirect access to the global network of networks which form the internet. IP transit services are typically purchased by retail ISPs from major tier 1 ISPs to provide connectivity to networks which do not warrant direct interconnections.

**Internet of things (IoT):** The interconnection via the internet of computing devices embedded in devices used by consumers and businesses.

**Internet service provider (ISP):** A company that provides end-users with access to the internet.

**Net neutrality framework**: The net neutrality rules and the relevant guidance issued by BEREC and Ofcom.

**Net neutrality rules**: The Open Internet Access Regulation (also referred to in this document as 'the Regulation').

**The Open Internet Access Regulation**: Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access.

**Peak throughput**: The highest throughput of traffic carried by a network in a given period, measured in bits per second.

**Peering**: The direct exchange of traffic between two ISPs' networks (rather than via an intermediate transit network). Traffic may be exchanged via a direct interconnection between the networks (private peering) or at an internet exchange point (IXP) (public peering). Peering is typically settlement-free.

**The Regulation**: The Open Internet Access Regulation.

**Specialised services**: Services other than internet access services, optimised for specific content and provided in accordance with the specialised services provisions in Article 3(5) of the Regulation.

**Tethering**: Sharing the internet connection of a phone or tablet with other devices such as laptops.

**Traffic throughput**: The volume of traffic carried by a network at a given point in time, reported in bits per second.

**Traffic volume**: The amount of data carried by a network in a given period, reported in bytes.

**Voice over IP (VoIP):** A technology that supports the transmission of voice communications over IP networks. Used in modern IP based telephone systems and internet based communications applications.

**Voice over Long-Term Evolution (VoLTE)**: The communications standard for voice calls in 4G Long Term Evolution mobile networks.

**Zero-rating**: A commercial practice whereby an ISP gives favourable access to specified content by not deducting usage relating to the content from a user's data allowance. Zero rating may be applied to a particular application or website (e.g. Facebook, Netflix) or category of applications or websites (e.g. social media, video streaming).

**5G**: 5th generation mobile network.