

Cloud services market study

BT response to Ofcom's Call for inputs

Issue: 1.0

BT Group

Executive summary

We are pleased that Ofcom is conducting a market study into cloud services to inform its approach to digital markets. The communications sector is constantly evolving and increasingly using cloud technology in a variety of ways. Therefore it is vital that regulators develop a sound understanding of the cloud services market to ensure effective competition, while continuing to enable the customer benefits observed from innovative technologies.

Cloud computing capabilities are pervasive within our networks, as well as within our business and customer services. We have a distinct, well-rounded view of the cloud services market, which has been informed through buying cloud services, partnering with hyperscalers¹, integrating and implementing cloud solutions for our customers, and building private clouds for our core network infrastructure and our customers.

While we broadly agree with the scope of this study, we are of the view that Ofcom should expand in two areas:

- 1) We agree that public cloud should be the focus, but this should be extended to hybrid-cloud environments (containing both public and private elements) where relevant – particularly where it concerns a customer's decision whether to use a private or public environment, and consider whether this disadvantages some customers or represents a failure of the public cloud to meet their needs;
- 2) While security and resilience are excluded from Ofcom's proposed scope, they are key factors in determining how customers choose and use cloud services. We think that Ofcom should include security and resilience in its scope to the extent it is used as a product differentiator, and consider whether any lack of competition could lead to customers experiencing less security and/or resilience than desired.

High switching and interoperability barriers might lead to consumer harm

Cloud services is a complex and evolving area, which provides many significant benefits to customers. However the overall structure of the market has become clearer, with many similar international studies internationally identifying concentration of providers at the Infrastructure and Platform as a Service (IaaS/PaaS) level, the high level of product differentiation, and the extent of hyperscalers' specialisation as a cause for concern.

The high barriers customers might face to switch cloud services provider (in the form of both high switching costs and limited interoperability) lead to market concentration and 'activity specialism' (where one provider has significant share of a particular activity). In turn, these might generate consumer harm in three ways:

- **Lock-in:** once a customer takes up a particular hyperscaler's cloud service, there is a risk of becoming locked into that hyperscaler's ecosystem because switching between providers can be difficult;
- **Anti-competitive leveraging:** hyperscalers have opportunity and incentive to use power held in one area to unfairly distort competition in another area, e.g. through tying, bundling and/or offering discounts; and
- **Vertical restraints and unfair contracting terms:** the scale and activity specialism of hyperscalers means it may be very difficult to negotiate contractual terms due to asymmetries in bargaining power which may stem from market power positions². This means that customers often have few competitive alternatives to consider which, in turn, could lead to poor or anti-competitive practices.

These three sources of harm can reinforce each other due to the interconnected nature of the cloud ecosystem and specialisms of individual providers. For example, an attempt by a hyperscaler to impose unfair contracting terms is more likely to be successful if the customer is locked into that hyperscaler's ecosystem.

¹ As per Ofcom's Call for Inputs, we refer to AWS, Google Cloud and Microsoft Azure collectively as "the hyperscalers".

² For example, the CMA refers there is "compelling evidence" that the features of digital markets in the UK and internationally often lead them to 'tip' in favour of one or a few firms. See [UK Government – Consultation on "A new pro-competition regime for digital markets"](#), part 1, paragraph 15 [accessed 02 November 2022].

N.B. Sections marked [X] contain confidential information which has been shared with Ofcom separately.

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1 Introduction

We welcome Ofcom's focus on digital markets in the communications sector, and the decision to start this work with a market study into cloud services. While several countries have studied competitive dynamics in cloud markets, we believe this is the first such study to be conducted with a focus on the communications sector, where cloud services have significant potential to rapidly change the shape and dynamics of the market. As sector regulator, it is vital that Ofcom understand both the benefits of cloud services and the potential harms brought about by market features, in order to consider ways to ensure effective competition while continuing to enable significant innovation for customers.

In this response, we discuss the ways in which BT uses cloud services, and the perspectives this gives us in [Section 2](#). [Section 3](#) introduces the challenges we see now and potentially in the future, and how the complexity of the value chains in cloud services has potential to amplify harms. We answer Ofcom's specific questions in [Appendix A](#).

We look forward to continuing discussions on these themes as Ofcom's study progresses.

2 BT has a well-rounded view on cloud services

As both a UK communications provider and a global company offering digital products and services, we believe BT is well placed to provide a distinct, well-rounded view of the market from multiple perspectives across different parts of the BT network – as we are buying public cloud services from hyperscalers for our internal use, partnering with hyperscalers to re-sell public cloud services to our customers, integrating public cloud services to implement cloud solutions for our customers and building private clouds for our core network infrastructure and our customers.

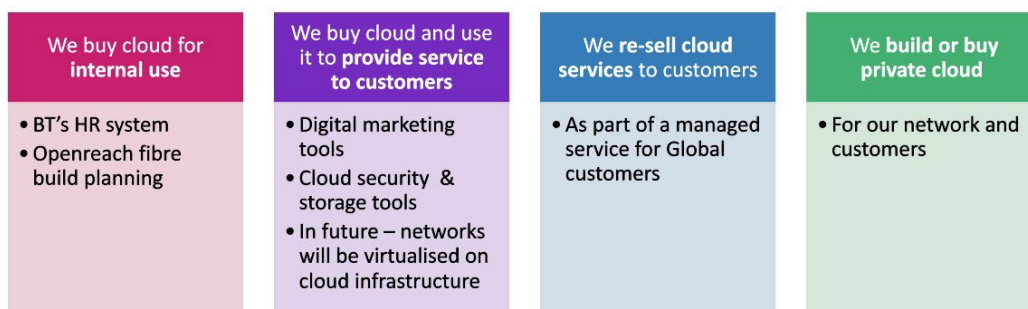


Figure 1. BT's interaction with the cloud services market

2.1 In core networks

Globally, communication providers (CPs) are gradually moving away from 'traditional' (vertically integrated) network models (where hardware is purchased from network equipment vendors and hosted in CP-owned data centres) towards cloud-oriented models. New network technologies (e.g. 5G) increasingly exploit virtual and cloudnative network functions (VNFs & CNFs) – where network functions can be carried out using commodity hardware (virtual) or hosted in the cloud (cloud-oriented). This has the potential to reduce the space, power and cost of operating networks, as well as simplifying network upgrades. Analysys Mason estimates that cloud-native technology will account for around 42% of the global mobile network market by 2026³.

There are three distinct ways to implement cloud networks for CPs (See Figure 2 below).

³ Cloud as the catalyst for new operator approaches to network and data, presented at Analysys Mason Telecoms Summit 2022.

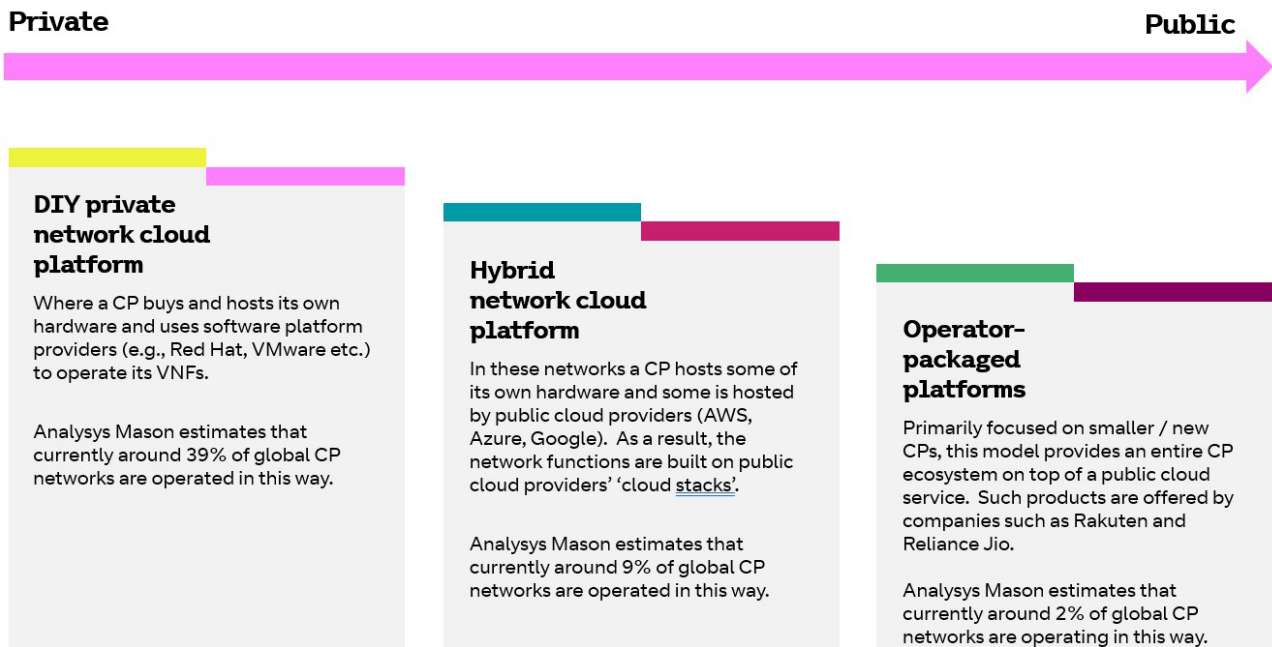


Figure 2. Ways communication providers implement cloud networks

Analysys Mason⁵ estimates that the majority (55%) of global CPs are still operating vertically-integrated networks, many (including BT) have opted for the DIY private network cloud platform model. As a result, we do not use public cloud services within our UK core network. The primary reason for this is related to security and resilience, and a desire to retain end-to-end control of our network assets.

In our view, it is unlikely that CPs who have invested significantly in private cloud technologies will migrate to fully public cloud platforms in the future – due to the different software stacks required and risks around service levels and operational control.

2.2 At the edge of our network

The network edge is becoming increasingly important to CPs as new use cases develop which require compute capabilities to be closer to customers. For instance, we created 5G Edge-XR, a real-time service which combines cloud computing and 5G networks for sports fans to watch immersive events⁴. Public cloud usage is prevalent in the network edge, as it enables the scalability and rapid deployment needed to meet requirements emerging from new use cases. [X]

The most use of edge technology in CP networks currently is for content delivery. CPs deploy Content Delivery Networks (CDNs) to distribute content toward the edge of their networks, avoiding overloading their core network – this is particularly helpful to manage peak demand, e.g. live sports events or game releases.

The first CDN was deployed over twenty years ago (in 1998⁵), as such this is a relatively mature activity with, what we believe is, a well-functioning, competitive market. The CDN market contains multiple competitors (e.g. Akamai, Cloudflare, Fastly, etc.) and has a level of interoperability to give access to content producers (e.g. standardised formats for content) which reduces barriers to entry.

⁴ [5G Edge-XR \(5gedgexr.com\)](https://www.5gedgexr.com) [accessed 22 October 2022]

⁵ [Company History | The Akamai Story](#) [accessed 22 October 2022]

CDNs are an established use-case for edge compute and operate as a competitive market, therefore we would encourage Ofcom to consider using this as a comparison to assess what factors have led to effective competition in this market. There may be learning which could be applied to i) less mature cloud activities and ii) behaviours of hyperscalers when they seek to compete in a more established and less concentrated adjacent market.

2.3 Our internal systems

Alongside many other businesses, we are increasingly using public cloud to support our business systems (both internal and customer-facing). Use of public cloud for these systems provides a flexible and scalable approach, gives simple access to employees, partners and customers, and reduces costs associated with maintaining and operating our own infrastructure.

In March this year we announced a partnership with Google Cloud for our data and AI transformation⁴, in May we announced an agreement with AWS as our preferred cloud provider for internal applications⁵ and in July we announced a partnership with Microsoft⁶, focussing on enterprise voice and cyber security. These platforms provide fast access to innovative functions, e.g. Openreach use Artificial Intelligence (AI) functions with Google Cloud to maximise the efficiency of their fibre-build planning.

2.4 As a systems integrator

We serve business customers in 180 countries across the world, providing them with managed network, security and cloud solutions. Our customers include some of the largest companies in the world, who are increasingly reliant on cloud services to carry out their business. These customers depend on us as a systems integrator, to help them navigate the complexities of the cloud market and provide them with superior access to the cloud services they need.

As a result, we've built partnerships with all major public Cloud Services Providers or CSPs (AWS, Google Cloud, Microsoft Azure and AliCloud), giving us a strong understanding of public cloud services, as well as the requirements of our customers.

⁴ [BT selects Google Cloud as strategic partner for group-wide data and AI transformation](#) [accessed 22 October 2022]

⁵ [BT signs five-year agreement with AWS as preferred cloud provider for internal applications to accelerate its digital transformation](#) [accessed 22 October 2022]

⁶ [BT and Microsoft announce strategic partnership](#) [accessed 2 November 2022]

3 Cloud services are vulnerable to lock-in, leveraging and vertical restraint

The hyperscalers are the main providers of cloud infrastructure services in the UK (81%)⁷ and globally (67%)⁸. This has led to a highly concentrated market where the key players have significant global scale, causing several international competition regulators to study them in more depth (including the EU⁹, France¹⁰, Netherlands¹¹, United States¹², Japan¹³, Australia¹⁴, Malaysia¹⁵, Singapore¹⁶ and Saudi Arabia¹⁹).

Customers choose public CSPs based on reliability, scalability, service levels etc. and will be attracted to providers who can offer scale and resilience, this presents a significant challenge to competitors and new entrants with less brand recognition and scale. We discuss the ways in which customers choose cloud services in [Appendix A.4](#).

There is a degree of activity-specialism within the three hyperscalers – AWS specialises in platforms, Google in data and Microsoft Azure in Enterprise (see [Appendix A.6](#)). The decreased competition within particular activities could further amplify the sources of harm outlined below.

We see harms manifesting now and are concerned that these harms may be exacerbated as hyperscalers gain market share. Ofcom should consider the impact of the significant global scale of the hyperscalers when assessing dynamics in the UK market (see [Appendix A.1](#)) for analysis of the international context.

3.1 Customers could become 'locked-in'

The complexity of switching between CSPs, could lead to customers becoming 'locked-in' to a particular provider's ecosystem. Given the high direct and indirect cost of switching, locked-in customers could be particularly susceptible to price rises or other forms of harm e.g. reducing quality. These seem unlikely in the short run as hyperscalers are expanding their customer base partly by offering attractive prices, but that might change when we reach a high take-up of cloud services.

[><] We think that improving the ability for customers to switch between cloud providers, will help facilitate a more competitive market. If customers can easily switch between CSPs, they will be more likely to benefit from the economies of scale from using one provider and more open to the possibility of using smaller providers.

Addressing the risk of lock-in would also benefit smaller providers and new entrants, who customers would see as 'less risky' if the option exists to move to a platform with global scale / high resilience etc. at a later date.

⁷ "81% of UK public cloud infrastructure services sales in 2021" Synergy Research Group, 4Q 2021 Cloud Infrastructure Services United Kingdom Market Share Report, March 2022

⁸ [Gartner Says Worldwide IaaS Public Cloud Services Market Grew 41.4% in 2021](#) [accessed 22 October 2022]

⁹ [Cloud computing | Shaping Europe's digital future \(europa.eu\)](#) [accessed 19 October 2022]

¹⁰ <https://www.utoritedelaconurrence.fr/sites/default/files/Consultation-publique-cloud-en.pdf> [accessed 19 October 2022]

¹¹ [Market study cloud services \(acm.nl\)](#) [accessed 19 October 2022]

¹² [competition in digital markets.pdf \(house.gov\)](#) [accessed 19 October 2022]

¹³ [220722_2EN.pdf \(iftc.go.jp\)](#) [accessed 19 October 2022]

¹⁴ <https://www.andrewbragg.com/post/statement-on-the-new-senate-inquiry-into-big-tech> [accessed 27 September 2022]

¹⁵ [ADVISORY NOTICE CLOUD-SERVICE-REGULATION.pdf \(mcmc.gov.my\)](#) [accessed 19 October 2022]

¹⁶ [Guidelines on Outsourcing \(mas.gov.sg\)](#) [accessed 19 October 2022] ¹⁹ [الإطار التنظيمي للحوسبة السحابية \(citc.gov.sa\)](#) [accessed 19 October 2022]

We think Ofcom should investigate the direct and indirect costs of switching to organisations like BT and consider how interoperability and portability could be improved without limiting the innovative features of cloud services.

3.1.1 Direct switching cost

Most CSPs charge a per-unit (data egress) fee to retrieve or remove data from their cloud platform. If a customer is attempting to move a significant workflow (e.g. a large company's billing system) from one provider to another, this can involve large quantities of data, resulting in high data egress charges.

In some cases, these charges have not changed for several years¹⁷, despite the network cost of transferring data reducing significantly during that time. We note that this issue was looked at extensively as part of the EU's research prior to publication of the Data Act¹⁸ finding that switching costs can represent up to 125% of the annual cost of a cloud subscription.

As we will discuss below, data egress is not the costliest component of switching in many cases. However, we think it would be reasonable for Ofcom to consider:

- a. Whether data egress for switching could be treated separately from operational data egress by CSPs, and charged differently;
- b. Current data egress pricing, historic trends and their relationship to underlying costs; and
- c. Whether the data egress charges for switching should be cost oriented.

3.1.2 Indirect switching costs

When switching between CSPs, customers need to consider several other, indirect, costs which often total more than any direct switching costs (see [Section 3.1.1](#)). These include costs associated with:

- Re-developing workflows/applications to work in a new cloud environment;
- Re-formatting data to suit requirements of new environment;
- Up-skilling workforce to develop/operate in new cloud environment;
- Replacing operational/management tools;
- Operating two cloud environments concurrently during any handover period (this is particularly applicable where a business critical system is being switched).

Our response to Question 4.7 ([Appendix A.8](#)) suggests a number of hypothetical decision-making situations related to the lock-in risk faced by buyers of public cloud services (for internal use). Ofcom may want to consider these as part of their work to assess the role played by switching costs and the costs of minimising the risk of being locked into a hyperscaler's ecosystem.

¹⁷ For example, AWS Direct Connect Pricing has remained at \$0.02/GB for their Ashburn location since at least 2011. 2011 pricing: [AWS Direct Connect Pricing \(archive.org\)](#), 2022 pricing: [Dedicated Network Connection - AWS Direct Connect Pricing - Amazon Web Services](#) [both accessed 3 November 2022]

¹⁸ [Data Act: measures for a fair and innovative data economy \(europa.eu\)](#) [accessed 23 October 2022].



3.1.3 The interoperability trade-off

Modern technologies (e.g. containerisation¹⁹) can allow cloud customers to build workflows / applications in ways which allow for simpler porting between cloud environments, but this can be more complex, pushing further cost to customers. These technologies go some way toward mitigating the risk of lock-in, however introduce an inevitable trade off. Customers face a choice between portability and using the proprietary/innovative features of a cloud environment, which cannot be ported. It is not always clear to developers which features are common across all cloud platforms and which are proprietary.

We think Ofcom should examine the use of modern cloud development techniques which enable interoperability between public CSPs. Ofcom should also consider options for making common features clearer without limiting the innovation offered through proprietary functionality.

3.1.4 Data portability could enable switching

While interoperability can be facilitated to some extent in the development of a workflow / application (see [Section 3.1.3](#)), the data which supports an application cannot always be ported to a new environment as easily. This is particularly relevant in SaaS applications, where data formats and storage are not always compatible between CSPs, meaning that significant effort is needed to re-format data if switching providers.

3.2 Hyperscalers can leverage into adjacent activities

At the start of [Section 3](#) we discussed activity-specialism among hyperscalers. These specialisms could be the result of market power which could be unfairly leveraged to distort competition in another market, e.g. through tying, bundling and/or offering significant discounts. Such a strategy would ultimately lead to consumer harm and further contribute to the lock-in discussed in [Section 3.1](#).

Consumer harm can take many forms. For example, in the context of the market study into online platforms and digital advertising, the CMA considered the following harms: reduced innovation and quality; higher prices paid for goods and services; poor returns for consumers (in return for what consumers are giving up, e.g. their data); erosion of privacy and data protection; and broader social harms.²⁰

Ofcom should consider in detail the different ways in which a hyperscaler might undertake anti-competitive leveraging from an activity in the cloud ecosystem into another area in the cloud ecosystem. Our response to Question 4.8 ([Appendix A.9](#)) sets out some concrete examples.

The difficulty with these leveraging behaviours is that they provide significant short-term benefits to customers, who are currently receiving significant discounts for buying into multiple segments within a provider's ecosystem. However, we think there could be a longer-term risk to competitive dynamics, eventually concentrating the market at multiple segments of the value chain and increasing the scale and power of the hyperscalers.

We welcome (and use) innovative technology across the cloud value chain, and public CSPs have created significant innovation to date, but competition should be fair and based on innovative merit within an activity. We think Ofcom should assess competition within each segment of the value chain separately and look at whether providers are leveraging market power between segments in a way that unfairly impacts rivals.

¹⁹ Containerisation is a software deployment process that bundles an application's code with all the files and libraries it needs to run on any infrastructure.

²⁰ [CMA – Online platforms and digital advertising market study final report, paragraph 6.4](#). See also [CMA – Merger Assessment Guidelines](#) [both accessed 28 October 2022]

3.3 Customers can struggle to negotiate terms

Due to their size and scale, commercial negotiation with hyperscalers can be difficult. Because of the market concentration and their activity-specialism, providers know that customers have little choice but to accept their standard terms. This could lead to customers agreeing to uncomfortable or even anti-competitive contractual clauses.

[Redacted] We are particularly concerned for smaller organisations who may not have the scale or expertise to insist such clauses are removed.

The Dutch competition authority, Authority for Consumers and Markets (ACM), refers to another example of unfair contractual terms (in particular licensing terms) in the context of their cloud market study: "...one market participant [Confidential: XXXXXXXX] that ACM has spoken to in this market study states that a cloud provider [Confidential: XXXXXXXX] (the licensor) goes to great lengths to conduct audits of CSPs that purchase licenses (the licensee), in which an unnecessarily large amount of information has to be provided and end-users of the licensee are sometimes approached directly by the licensor with a competing offer."²¹

We think Ofcom should use this market study to examine the contractual practices of CSPs, in particular their standard terms as presented to customers. Consideration should be given to whether best practice guidelines could protect organisations (particularly smaller companies) from having to enter into poor commercial agreements.

3.4 Competitive harms could reinforce each other

Each hyperscaler operates in all parts of the cloud value chain and many, if not all, of the digital value chain. This is generally because, as Ofcom has highlighted, service delivery often involves complex ecosystems of mutually supporting services.²² For example, Google's role in cloud services, operating systems, digital assistants, search, content delivery, and smart home services.

This means that a potential competitive harm related to one part of the value chain is likely to reinforce scope for further competitive or consumer harms in other parts of the value chain. For example, a hyperscaler with a position of market power in IaaS/PaaS could protect and reinforce its market power by imposing high switching costs which, in turn, reinforces its ability to leverage its position in IaaS/PaaS into other markets (e.g. SaaS) in an anticompetitive manner. Similarly, a hyperscaler with a market power position that allows the imposition of contractual terms could strengthen risks of lock-in. These theoretical examples demonstrate the complexity of the value chain and the ability for one type of anti-competitive behaviour to reinforce or amplify others.

It is therefore important that Ofcom takes a comprehensive approach in which all potential sources of competitive and consumer harm and the links between them are considered and, where appropriate, addressed.

²¹ [ACM - Market Study Cloud services](#) [accessed 28 September 2022].

²² [Ofcom's approach to competition and consumer issues in internet-based communications markets, paragraph 3.4\(b\)](#) [accessed 1 November 2022].

3.5 Sovereign cloud environments could impact competition

Sovereign cloud environments are designed to meet digital sovereignty requirements within a particular jurisdiction.^{23,24} Several countries (including France, Germany, Spain, Italy and Singapore) have announced joint ventures between hyperscalers and local partners to produce sovereign clouds. This is to mitigate data protection, privacy and portability concerns, since the largest CSPs are US-based, and ensure certain data is stored, physically within a country's jurisdiction.

For example, Google have formed partnerships with SN3 in France, T-systems in Germany, Minsait in Spain and Telecom Italia in Italy.²⁵ Microsoft have formed similar partnerships. Oracle are also launching sovereign cloud regions for the EU in 2023.²⁶

Given the interoperability and data portability challenges, there is a risk that this trend results in fragmentation of the cloud services market. By being granted permission to build sovereign clouds, hyperscalers will likely become further entrenched in these local markets, possibly limiting competition and driving lock-in. This could also introduce further data portability challenges if sovereign clouds are produced by different hyperscalers. Given the UK government's cloud first policy²⁷, consideration of sovereignty of the public cloud is critical. BEREC has suggested that due to the high degree of concentration in the IaaS and PaaS market, openness of the internet ecosystem could be limited due to switching barriers (technical and financial) and/or contractual obligations.²⁸

Ofcom should consider what the formation of sovereign cloud environments means for the UK in terms of its own data sovereignty, as well as the UK's ability to conduct data transfers to these countries. See [Appendix A.1](#) for further examination of the international context.

²³ [T-Systems Sovereign Cloud | Google Cloud](#) [accessed 21 October 2022]

²⁴ [Sovereign Cloud | Regional Cloud Infrastructure | VMware](#) [accessed 21 October 2022]

²⁵ [Advancing digital sovereignty on Europe's terms | Google Cloud Blog](#) [accessed 21 October 2022]

²⁶ [Sovereign Cloud | Oracle United Kingdom](#) [accessed 1 November 2022]

²⁷ [Government adopts 'Cloud First' policy for public sector IT - GOV.UK \(www.gov.uk\)](#) [accessed 2 November 2022]

²⁸ [Public consultation on the draft BEREC Report on the Internet Ecosystem | BEREC \(europa.eu\)](#) [accessed 2 November 2022]



Appendix A BT answers to Call for input questions

Appendix A.1 Question 2.1 – International context

How do you see developments in the international context impacting the provision of cloud services in the UK?

CSPs, including the Hyperscalers, will be impacted by international regulations which will affect the UK cloud services market. A number of other countries have conducted market studies which might provide lessons for Ofcom. International regulators will look to take action on the basis of findings from these studies. Actions imposed by these regulators may result in changes that could affect market conditions in the UK and regulation implemented in the UK could similarly impact the international regulatory landscape for CSPs.

A number of countries have moved to building sovereign clouds (See [section 3.5](#)) which could impact the UK. The UK might also like to consider security and resilience issues raised in other countries (See [Appendix A.2](#)).

The most significant international regulation is likely to be the impending EU Digital Markets Act.

The following articles, in particular, are likely to impact the cloud sector²⁹:

- Article 6(6) states that a gatekeeper must not use any technical or other means to restrict the ability of endusers to switch³⁰. Article 6(9) states that gatekeepers must meet the wishes of end-users (and third parties authorised by an end user) to achieve effective data portability at their request and at no charge. This concerns the end-user's data.

Cloud market studies in Japan, the Netherlands and France provide a helpful starting point for the UK's own market study into cloud services.

Japan

The Japanese competition authority found that 20% of cloud service customers (CSCs) reported that there was insufficient information available when selecting a service, indicating an information asymmetry.³¹

Ofcom might wish to investigate whether this asymmetry is present in the UK market. Ofcom might also seek to investigate the Japanese Fair Trade Commission's recommendation to, "*minimise technical, contractual and economic constraints that prevent cloud service customers from switching to cloud services of other CSPs*".

²⁹ [EUR-Lex - 32022R1925 - EN - EUR-Lex \(europa.eu\)](#) [accessed 3 November 2022]

³⁰ N.B. The gatekeeper shall not restrict technically or otherwise the ability of end users to switch between, and subscribe to, different software applications and services that are accessed using the core platform services of the gatekeeper, including as regards the choice of Internet access services for end users

³¹ [Report Regarding Cloud Services : Japan Fair Trade Commission \(jftc.go.jp\)](#) [accessed 21 October 2022]

Netherlands

The Netherlands have recommended the following changes to the EU's Data Act³²:

- ACM would like to **see that the egress fees are lowered to cost-oriented tariffs** so that these tariffs, too, do not form any barrier to data transfer between various CSPs.

To address interoperability: The Data Act does include provisions on the use of open standards for switching, but not for interoperability per se. ACM considers that the Data Act should also provide for this, for example by **obliging CSPs to make APIs public, so that other CSPs can connect their services to them**, thereby breaking open silos.

These could be sensible measures to look at in the UK if Ofcom find market power, however we would draw attention to the impact of indirect switching costs as discussed in [Section 3.1.2](#).

France

Ofcom should take into consideration findings from France's ongoing investigation into cloud services when these become available.³³

Hyperscalers own a significant proportion of infrastructure which supports the cloud stack.

US-based hyperscalers were responsible for 67.1% of global market share for IaaS in 2021.³⁴ The risk posed by foreign-based entities to data sovereignty and network resilience in the UK should be considered. As well as this, as outlined in [Section 3.5](#) several governments have moved to build their own sovereign cloud environments to address data protection, privacy and portability concerns.

Several complaints have been filed internationally which may highlight competition issues which might apply to the UK.

German software company Nextcloud³⁵ and French CSP OVHcloud³⁹, for example have filed complaints in the European Commission. These, and other cases, may impact the international regulatory landscape for cloud services.

³² [ACM: amendments to Data Act necessary for promoting competition among cloud providers | ACM.nl](#) [accessed 21 October 2022]

³³ [The Autorité de la concurrence starts proceedings ex officio to analyse competition conditions in the cloud computing sector | Autorité de la concurrence \(autoritedelaconcurrence.fr\)](#) [accessed 21 October 2022]

³⁴ [Gartner Says Worldwide IaaS Public Cloud Services Market Grew 41.4% in 2021](#) [accessed 21 October 2022]

³⁵ [EU tech sector fights for a Level Playing Field with Microsoft \(nextcloud.com\)](#) [accessed 21 October 2022] ³⁹ [Microsoft faces cloud antitrust charges after OVHcloud files suit | TechRadar](#) [accessed 21 October 2022]

Appendix A.2 Question 4.1 - Scope

Do you agree with the scope of the market study?

We broadly support the scope proposed by Ofcom for this market study, in particular that the study should be focussed on public, as opposed to private cloud services. However, customers often choose to use a combination of public and private cloud environments, a 'hybrid-cloud' approach, and therefore Ofcom may need to consider some issues relating to private cloud environments where these relate to hybrid cloud.

We note Ofcom's proposal to focus on competitive dynamics within this study and exclude adjacent considerations such as security and resilience. However, we observe that many of the issues considered by cloud service customers relate to topics such as security and resilience, and therefore these issues will need to be considered where they link to wider competitive dynamics (e.g. we think security and resilience is a key consideration in how customers choose cloud services).

With respect to the security and resilience of cloud services in general, we note that both DCMS³⁶ and the FCA³⁷ are considering this presently. While this work would sit outside of this study, Ofcom should consider whether the findings of these bodies are suitable for the communications sector and/or whether further investigation is needed.

Appendix A.3 Question 4.2 – Cloud usage

Are there other ways to those listed in paragraphs 4.11 to 4.14 in which customers use cloud services, and factors which determine their cloud usage, that we should examine?

We agree with all of the reasons listed by Ofcom. In addition, we would like to emphasise the importance of customers' commercial models in determining how they use cloud. For example, the service level offered by a CSPs would need to be consistent with the service level offered by the customer to their end users. Such considerations are particularly relevant in hybrid cloud environments where customers must choose whether to host an activity on a private or public cloud.

³⁶ [Proposal for legislation to improve the UK's cyber resilience - GOV.UK \(www.gov.uk\)](#) [accessed 31 October 2022]

³⁷ [DP22/3: Operational resilience: critical third parties to the UK financial sector | FCA](#) [accessed 31 October 2022]

Appendix A.4

Question 4.3 – Choosing cloud services

Do you agree that the features set out in paragraph 4.15 are the most important features for customers when choosing cloud services?

We agree with the features set out by Ofcom as being important for customers when choosing cloud services. In addition, we would suggest including five further features:

Implementation time – the time taken to implement an activity on the cloud can be a deciding factor when choosing a cloud service, particularly where there are specific and time-critical business needs. This aspect could be considered as part of the ‘ease of integration’ feature already identified by Ofcom.

Security & resilience – cloud customers are often seeking a CSP who can offer a reliable, well supported and scalable platform, this ensures that any activity deployed on the cloud is ‘future-proof’. In addition, customers need platforms which can be trusted with their data, so security is a key consideration.

Ecosystem – for example, if a customer already buys their SaaS products from a particular provider, there can be particular benefits to buying their IaaS/PaaS from them also.

Legal requirements – As we outline in [Section 3.5](#), some countries have specific, legal requirements relating to CSPs. These can be a contributing factor when choosing a provider if the customer is a global organisation or plans to launch services in these countries in future.

Strategic considerations – The risk of ‘lock-in’ (as described in [Section 3.1](#)) can influence decisions over CSPs. For example, a customer may choose a provider in order to maintain a multi-cloud environment and not become dependent on one provider.

Appendix A.5

Question 4.4 – Buying patterns

Is our characterisation of how cloud services are sold and buying patterns correct at paragraphs 4.16 to 4.18? Are there other methods?

In general, we agree with Ofcom’s view on selling and buying patterns for cloud services. However, we would also point out that some CSPs structure their pricing such that other services are required or heavily discounted if other services are purchased. We discuss this in [Section 3.2](#).

Appendix A.6 Question 4.5 – Characterisation of cloud infrastructure competition

Do you agree with our characterisation of competition for different types of services and customers? Are there any other aspects where competition may vary?

BT’s understanding of Ofcom’s position

We understand Ofcom’s initial view is that competition in cloud services varies around:

- **Different types of service models:** IaaS, PaaS and SaaS (with this market study focusing on IaaS and PaaS);
- **Different types of deployment models:** public, private and hybrid cloud (with this market study focusing on public cloud); and
- **Different types of customers:** although Ofcom has not provided a detailed description of the types of customers it intends to consider in this market study, the approach taken by other regulators internationally suggests this would at least capture different types of customers by **size** (e.g. SMEs, large corporations), **stage of cloud adoption** (e.g. businesses migrating to the cloud for the first time, businesses that are cloud native or have already migrated to the cloud), and **sector** (e.g. software developers, telecommunications providers, broadcasters). These different types of customers would in turn be likely to have different preferences and behaviours in terms of how they use cloud services and how they chose CSPs.

Based on this characterisation of competition, we understand that Ofcom’s proposed competition assessment will centre around the three main steps below:

- **Step 1:** considering whether to assess competition for IaaS and PaaS as a whole or separately;
- **Step 2:** considering whether to assess competition according to customer needs; and
- **Step 3:** assessing the impact of suppliers of professional services in shaping competition.

BT's position

We are of the view that differences in competitive dynamics between IaaS and PaaS (e.g. with some players exclusively acting in PaaS) is likely to support considering IaaS and PaaS separately.

We broadly agree with Ofcom's characterisation of competition for different types of services and customers. However, we encourage Ofcom to consider other aspects where competition may vary given the complexity of the cloud services supply chain.

Ofcom's competition assessment should give due consideration to the role that product differentiation and the extent to which hyperscalers' specialisation have in competitive dynamics. There are marked differences in hyperscalers' areas of strength. Differentiation and specialisation in cloud services is high, which means that market concentration could be much higher and customer choice more restricted than indicated by more generic shares of supply (as those presented by Ofcom³⁸).

Even the largest cloud services providers specialise in particular services and tailor their business model accordingly. For example:

- **AWS** is specialising in services delivered over the cloud and is reported to have the largest set of its own cloud products and services of all private cloud services providers; it also operates a more closed ecosystem.⁴³ Particularly relevant for Ofcom's remit, AWS is a market leader in the broadcast and videoprocessing cloud market.³⁹
- **Microsoft** is the leading hyperscaler when it comes to Enterprise SaaS products. While we understand Microsoft has a 17% share of worldwide revenues (including but not limited to Enterprise products)⁴⁰, the share of Enterprise SaaS products specifically is likely to be significantly higher given the ubiquity of

Microsoft's cloud software. A recent survey of enterprise cloud users indicates 80% of them are running 'significant workloads' or 'some workloads' on Microsoft Azure, with an additional 15% experimenting with or planning to use Microsoft Azure.^{41 42}

- **Google** specialises in data and Artificial Intelligence (AI) using its open-source Kubernetes engine and a hybrid public/private platform (Anthos).⁴³

Appendix A.7 Question 4.6 – Characterisation of cloud ecosystems competition

What are your views on our characterisation of cloud ecosystems?

BT's understanding of Ofcom's position

We understand that Ofcom characterises cloud ecosystems as "a collection of complementary products and services that work together to create utility for customers" which also "typically include an interface or gateway that intermediates multiple sides of the market, such as customers, hardware producers and software developers".⁴⁴

³⁸ [Ofcom Cloud services market study's Call for inputs, dated 6 October 2022, figure 4.1](#).⁴³ Analysys Mason (2022), [AWS in the telecoms industry](#) [accessed 3 November 2022].

³⁹ See [Appendix A.9](#), Table A.2, Note 1.

⁴⁰ [Global cloud software market vendor share 2021 | Statista](#) [accessed 27 October 2022].

⁴¹ [Statista - Public cloud adoption by provider worldwide 2022](#) and [Flexera - 2022 Flexera State of the Cloud Report](#) [both accessed 3 November 2022].

⁴² It is worth noting that in 2018 it was estimated that SaaS business accounts for roughly 60% of Microsoft's public cloud business in Europe. Source: IDC - European Public Cloud Services Market Shares, 2018: IaaS/PaaS Vendors Consolidating their Market Positions (published in July 2019).

⁴³ Analysys Mason (2022), Google cloud in the telecoms industry.

⁴⁴ Ofcom defines ecosystems as "a collection of complementary products and services that work together to create utility for customers. Ecosystems also typically include an interface or gateway that intermediates multiple sides of the market, such as customers, hardware producers and software developers." Source: [Ofcom Cloud services market study's Call for inputs, dated 6 October 2022, paragraph 4.23](#).

Based on this characterisation of cloud ecosystems, we understand that Ofcom’s assessment in this area will focus on the cloud ecosystems of AWS, Microsoft and Google. In particular, each of these hyperscalers:

- Full cloud stack service offerings (IaaS, PaaS, SaaS), and the extent to which they are complementary;
- Unique cloud environments; and
- Distribution channels for third-party services (which each hyperscaler controls).

BT’s position

We broadly agree with Ofcom’s characterisation of cloud ecosystems and believe it is appropriate to focus on the impact of the cloud ecosystems of AWS, Microsoft and Google on the competitive landscape for public cloud infrastructure services. These three hyperscalers have a material and persistent share of supply of public cloud infrastructure services⁴⁵.

Appendix A.8 Question 4.7 – Cloud infrastructure competition dynamics

Do you agree with our proposed approach for considering the dynamics in cloud infrastructure services competition, and what do you think are the most important issues to examine?

BT’s understanding of Ofcom’s position

We understand that Ofcom will consider the dynamics of public cloud infrastructure services competition (Theme 1 in Ofcom’s Call for Inputs) by examining:

- Indicators of market power.
- The strength of competition between hyperscalers.
- The competitive constraints from smaller providers and potential new entrants.
- Market features that can raise barriers to entry and expansion, including:
 - High capital costs;
 - Economies of scale and scope;
 - The nature and scope of any network effects and ;
 - Barriers to multi-cloud and/or switching which may reduce the intensity of competition for customers already buying cloud services.
- Business practices that can raise barriers to entry and expansion, including:
 - Whether barriers to moving data between CSPs make it difficult for customers to switch or multisource, or strengthen network effects.
 - Whether a lack of interoperability between the hyperscalers’ cloud services and those of others represents a significant barrier to switching or strengthens network effects.
 - The extent to which hyperscalers can increase barriers to entry and expansion by tying in desirable software with their clouds or limiting the ability to access such software on other clouds.
 - Whether the hyperscalers could use their vertical presence in IaaS to favour their PaaS businesses at the expense of Independent Software Vendors (ISVs) who only offer PaaS services.⁴⁶

BT’s position

In line with our response to [Question 4.5](#), we are of the view that an appropriate examination of indicators of market power should give due consideration to the role that product differentiation and the extent of hyperscalers’ specialisation have in competitive dynamics.

⁴⁵ [Ofcom Cloud services market study’s Call for inputs, dated 6 October 2022, figure 4.1.](#)

⁴⁶ Independent Software Vendors (ISVs) (e.g. IBM) are providers of cloud services, typically PaaS and/or SaaS, that do not own any of the underlying raw computing resources.

For BT, the most important issues to examine in relation to the dynamics in cloud infrastructure services competition are the three ways in which consumer harm might be generated:

- **Lock-in:** once a customer takes up a particular hyperscaler’s cloud service, there is a risk of becoming locked into that hyperscaler’s ecosystem because switching between providers can be difficult;
- **Anti-competitive leveraging:** we discuss this in the context of ecosystem competition (see our response to [Question 4.8](#)); and
- **Vertical restraints and unfair contracting terms:** the scale and activity specialism of hyperscalers means it may be very difficult to negotiate contractual terms due to asymmetries in bargaining power which may stem from market power positions⁴⁷. This means that customers often have few competitive alternatives to consider which, in turn, could lead to poor or anti-competitive practices.

We are of the view that Ofcom should consider in detail (1) the direct and indirect switching costs to organisations like BT – i.e. buyers of public cloud services for internal use, and (2) the costs to these organisations of minimising the risk of being locked into a hyperscaler’s ecosystem. Ofcom could do this by considering a number of hypothetical decision-making situations that such organisations might face. Ultimately their decisions are largely based on an assessment of the costs (including any sunk costs, building and running costs) and benefits of alternative options (e.g. where switching cloud provider would make sense only if the benefits from doing so are larger than the costs). For example:

Hypothetical decisionmaking situation	Assumed initial position	Alternative position(s)
1. Buyer considering switching provider of public cloud services for supporting its internal functions.	Buyer buys SaaS/PaaS/IaaS from a hyperscaler to have access to a full suite of enterprise software products. For example, this could be buying from Microsoft to have access to applications such as Teams and Office 365.	Buyer considers switching to an alternative provider that can offer the same breadth of services (e.g. Google’s SaaS/PaaS/IaaS including software applications such as Google Workplace).
2. Buyer procuring a billing application.	Buyer has an internal billing application which is relatively costly and complex to manage.	<p>Alternative position 1 – Lower cost and higher risk of lock-in (compared to Alternative position 2 below): Building a billing application in a way that is specific to a hyperscaler and, therefore, effectively makes switching excessively costly for it to be a genuine possibility.</p> <p>Alternative position 2 – Higher cost and lower risk of lock-in (compared to Alternative position 1 above): Building a billing application in a way that is not specific to a particular hyperscaler and, therefore, would not make switching excessively costly.</p>

Table A.1. Hypothetical decision-making situations related to lock-in faced by buyers of public cloud services from a hyperscaler for internal use

⁴⁷ For example, the CMA refers there is “compelling evidence” that the features of digital markets in the UK and internationally often lead them to ‘tip’ in favour of one or a few firms. See [UK Government – Consultation on “A new pro-competition regime for digital markets”](#), part 1, paragraph 15 [accessed 02 November 2022].

Appendix A.9 Question 4.8 – Cloud ecosystem competition dynamics

Do you agree we should examine cloud ecosystem competition? How do you see cloud ecosystems currently developing, including around core areas set out in paragraphs 4.40 and 4.45?

BT's understanding of Ofcom's position

We understand that Ofcom will consider cloud ecosystems competition (Theme 2 in Ofcom's Call for Inputs) by examining:

- Customer benefits from cloud ecosystems (if they enhance competition). For example: better customer experience, lower search costs, and/or lower prices.
- Customer harm from cloud ecosystems (if they distort competition). For example: difficulty in switching, creation of gatekeepers.
- How cloud ecosystems are influencing the way customers buy cloud services.
- Whether the way in which the hyperscalers design, support and price their services enhance the attractiveness of purchasing solutions exclusively from them, as opposed to customers building their own solutions from different suppliers, including ISVs.
- How the impact of ecosystems on customers' choice might in turn shape competition by:
 - Increasing barriers to switching.
 - Making ISVs dependent on hyperscalers' ecosystems as a key route to market.
 - Limiting the ability of suppliers of professional services to facilitate switching or multcloud use.
- The extent to which any of the above features may raise competition concerns by:
 - Exploring whether the development of cloud ecosystems might risk dampening competition across the cloud stack.
 - Assessing whether the development of cloud ecosystems may further strengthen the position of hyperscalers in cloud infrastructure services.
 - Assessing whether the vertically integrated hyperscalers have the potential to distort competition in the SaaS and PaaS layer.

BT's position

We strongly support Ofcom's intention to examine cloud ecosystem competition and we broadly agree with its proposed approach for considering the dynamics in cloud ecosystems competition.

For BT, the most important issue that Ofcom should examine in this area is the consumer harm that could potentially arise from **anti-competitive leveraging**, where hyperscalers have opportunity and incentive to use power held in one area to unfairly distort competition in another area, e.g. through tying, bundling and/or offering discounts. This could happen, for example, if the hyperscaler offers a bundled product at a price that cannot be matched by rivals that are as efficient as the hyperscaler.

Ofcom should consider in detail the different ways in which a hyperscaler might undertake anti-competitive leveraging from an activity in the cloud ecosystem into another area in the cloud ecosystem. For example, this could be leveraging from an activity in IaaS/PaaS into an activity in SaaS. The following table sets out some concrete examples.

Examples of potentially anti-competitive leveraging

Example 1 – In October 2022, Microsoft modified the outsourcing and hosting terms within its Services Provider Licensing Agreement (SPLA). The aim was to make it easier for Microsoft's enterprise customers to bring Microsoft software to non-Microsoft infrastructure and scale the cost and size of their or their customer's Microsoft systems on their own hardware. However, this only applies to customers that are offering hosting from their own data centres, not to customers buying Microsoft licenses to host on others' data centres. To "strengthen the hoster ecosystem" Microsoft has

removed the ability to outsource to Alibaba, AWS, Google, Microsoft, or anybody using those companies as part of their hosting.⁴⁸ [3<]

Example 2 – AWS is highly regarded for its TV production SaaS products, which BT Sport (and many other content producers) use extensively to produce high-quality content (See ‘Note 1’ below). However, compared to the share AWS have on TV production SaaS products, they have a much lower market penetration on the IaaS/PaaS segments providing content delivery networks (CDNs), where companies such as Akamai and Cloudflare have traditionally competed. The AWS SaaS product charges a data egress fee for content sent to third-party CDNs, meaning AWS zero-rate traffic which is destined to their own CDN. The egress fees charged for content sent to third-party CDNs provide a significant advantage to AWS as they seek to establish themselves as a CDN.

Example 3 – Microsoft is highly respected in providing Enterprise SaaS products, such as Office 365 and Teams.⁴⁹ Microsoft has recently been accused of using Windows and Office to feed the growth of Azure by incentivising Microsoft SaaS customers to use their Azure IaaS/PaaS products through discounts.⁵⁰ [3<]

Table A.2. Examples of potentially anti-competitive leveraging

Note 1: [3<]

Ofcom should bear in mind that any consideration of leveraging should cover the potential for both consumer benefits and harms arising. The net effect on consumer welfare is not always clear. Commercial behaviour designed to improve a firm’s competitive position can be pro-competitive and thus bring consumer benefits but can cause consumer harm where it unfairly damages the competitive process. Consumer harm can take many forms. For example, in the context of the market study into online platforms and digital advertising, the CMA considered the following harms: reduced innovation and quality; higher prices paid for goods and services; poor returns for consumers (e.g. in return for their data); erosion of privacy and data protection; and broader social harms⁵¹.

⁴⁸ [Ars Technica - Microsoft EU cloud revisions just so happen to exclude Google, Amazon | Ars Technica](#) and [Microsoft Cloud Partner Network – New licensing benefits make bringing workloads and licenses to partners’ clouds easier](#) [both accessed 28 September 2022].

⁴⁹ Microsoft say the “more than 330,000 companies worldwide” use their Teams product. [5 reasons why you should start using Microsoft Teams today](#) [accessed 23 October 2022].

⁵⁰ [Financial Times - Microsoft’s tactics to win cloud battle lead to new antitrust scrutiny](#) [accessed 27 October 2022].

⁵¹ [CMA – Online platforms and digital advertising market study final report, paragraph 6.4](#) [accessed 28 October 2022]. See also [CMA – Merger Assessment Guidelines](#) [accessed 28 October 2022]

Appendix A.10 Question 4.9 – Concerns

Do you have any concerns regarding any conduct or activities of any provider(s) that may adversely affect market dynamics now or in the future

We are seeing harms start to manifest currently and are concerned that these could worsen in the future, impacting on competition in the cloud services market.

- **Vendor Lock in**
 - Economies of scale mean that it is cheaper for companies (and countries) to outsource the provision of cloud services to hyperscalers. This creates a dependency on hyperscalers.
 - Lock in reduces incentive to provide high-quality services at competitive prices.
 - Poor interoperability reinforces lock in. Interoperability concerns in the cloud have been raised across Europe and have led to initiatives such as Gaia-X.⁵²
 - This concern was also raised by the US House judiciary study on digital markets.⁵³ ○ Issues with data portability creates a barrier to entry for competitors and a barrier to exit for customers.
 - **Egress fees:**
 - ✦ **High charges:** The EC have conducted analysis on switching between CSPs.⁵⁴ Ofcom might seek to investigate the degree to which high egress fees inhibit switching.
 - ✦ **Lack of transparency:** The 2022 US House Judiciary Committee ‘Investigation of Competition in the Digital Marketplace’, found that egress fees are often not transparent.⁵⁵
- **Concentration risk:** To address network resilience and vendor lock-in risks, BT has a multi-cloud strategy. We recognise that resilience has been excluded from the scope of this study, but believe it is important to remain cognizant of the evolving risk hyperscalers pose in becoming increasingly entrenched in the market. We are aware of the proposed legislation from the PRA relating to critical third parties and proposed legislation from DCMS on cyber resilience.
- **Data sovereignty:** See
- **Unfair terms:** Where barriers to switching are strong this could reduce choice of potential partners for telecoms providers, in turn enabling hyperscale providers to dictate commercial and technical terms and conditions. There are also potential problems of asymmetry in bargaining power with CSPs given their dominance in the cloud services market. This could be exacerbated where the same hyperscalers also provide other, related services to telecoms providers which they may depend on, and the risk of being left behind as other telecoms operators rush to accept unfair terms (given the lack of choice). Ultimately this lack of choice, if it translates into unfair terms, could harm innovation as well as telecoms operators’ profitability and capacity to invest in public mobile networks⁵⁶. If this were the case, customers would have less resilient services and/or less choice. Connectivity partners might also get poorer partnership terms than would otherwise be the case. This could limit their ability to compete in cloud and network edge services markets, by impacting the partnership terms for inputs they require to remain competitive.
- **Leveraging:** Digital cloud platform providers have already partnered with a number of telecoms operators to provide network edge services. Recent examples include partnerships AWS have agreed with Verizon and Vodafone.⁵⁷ In these partnerships, the telecoms provider typically provides infrastructure and access to the network edge, including connectivity and space in local exchanges and sites. Where network effects and barriers to switching are strong this could reduce choice of potential partners for telecoms providers, in turn enabling hyperscale providers to dictate commercial and technical terms and conditions. This could be exacerbated where the same hyperscalers also provide other, related services to telecoms providers which they may depend on, and the risk of being left behind as other telecoms operators rush to accept unfair

terms (given the lack of choice).⁵⁷ A lack of choice, if it translates into unfair terms, could harm innovation as well as telecoms operators’ profitability and capacity to investment in public mobile networks. If this were the case, customers would have less resilient services and/or less choice. Connectivity partners might also get poorer partnership terms than would otherwise be the case. This could limit their ability to compete in cloud and network edge services markets, by impacting the partnership terms for inputs they require to remain competitive.

- **Predatory pricing:** As CISPE have highlighted, firms could cross-subsidise cloud computing infrastructure offerings by utilising profits from other markets or segments.⁶²
- **Strategic market status (SMS):** While SMS has not been achieved (or declared) as yet, the CMA and Ofcom should be mindful of the hyperscalers reaching a tipping point in the cloud services market and seek to take action to maintain fair competition. The SMS regime will designate where a firm is found to have substantial and entrenched market power in at

⁵² [Home - Gaia-X: A Federated Secure Data Infrastructure](#) [accessed 21 October 2022]

⁵³ [competition_in_digital_markets.pdf \(house.gov\)](#) [accessed 21 October 2022]

⁵⁴ [DOC_1 \(europa.eu\)](#) [accessed 3 November 2022]

⁵⁵ [competition_in_digital_markets.pdf \(house.gov\)](#) [accessed 21 October 2022]

⁵⁶ [BT Response to Ofcom’s discussion paper on ‘future approach to mobile markets’](#) [accessed 3 November 2022]

⁵⁷ [b77d_4490e58b3da3490590cf55d15f561e4b.pdf \(usfiles.com\)](#)

least one digital activity, providing them with a strategic position.⁵⁸ Ofcom should work to identify indicators that a tipping point might be reached and intervene before this occurs.

- **Barriers to use of multi cloud:** Some firms, including BT, have adopted a strategy of using more than one CSP in order to address network resilience and vendor lock-in risks. This is a costly strategy that may not be financially viable for smaller firms. The practicality of adopting a multi-cloud strategy might also be limited because of interoperability concerns.⁵⁹
- **Innovation:** Reduced competition in the cloud services market could lead to reduced innovation.

Appendix A.11 Question 4.10 – Remedies

Are there any remedies that you believe we should investigate further to mitigate some of the potential risks we've identified in this document or concerns you have with the market?

We do not feel it's appropriate to recommend specific remedies for further investigation, until Ofcom have identified specific concerns. We look forward to reviewing findings from the cloud market study and working with Ofcom further to evaluate remedies once there is a clearer understanding of the challenges within the UK cloud services market.

⁵⁸ [Appendix L: assessment of strategic market status \(publishing.service.gov.uk\)](#) [Accessed: 3 November 2022]

⁵⁹ [BEREC \(europa.eu\)](#)

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