November 23, 2023

CMA Cloud Services Market Investigation

AWS's response to the CMA's Issues Statement, published on 17 October 2023

1. AWS appreciates the opportunity to comment on the Competition and Markets Authority's ("**CMA**") Issues Statement, published on 17 October 2023, in relation to "cloud infrastructure services" in the UK, part of the global market for IT services. As the CMA is in the early stages of its assessment we are keen to support the CMA in its understanding of how this sector has developed and the role that AWS is playing. We also welcome the opportunity to address some misconceptions of the functioning of the industry as a whole.

2. AWS is well-placed to provide color on these issues as the pioneer of the on-demand delivery of IT services in 2006, which became generally known as "cloud services". For the first time, any potential customer with a credit card and online access could instantly use IT services on a pay-as-you-go basis, without upfront investment in infrastructure, providing customers with an additional option to on-premises hardware and software to meet their IT needs. Since then, we have grown the quality and types of services on offer to enable our customers to effortlessly scale and innovate, while reducing the cost and burden of managing complex IT environments. Having started out with only three services, AWS today offers over 200 services which have opened the door to significant innovation and competition across a number of service areas, including databases, storage, networking, analytics and security. This has helped businesses across all sectors of the economy thrive, as well as fueling an explosion of new business models that benefit from on-demand IT services, such as ride-sharing (*e.g.*, Uber) and room rental (*e.g.*, Airbnb).

3. Competition to offer on-demand IT services has grown rapidly since AWS launched, while competition from on-premises providers continues to be fierce. According to leading industry analyst Gartner, less than 11% of IT spending is on the cloud nearly two decades after AWS launched.[1] As noted in Ofcom's press release that accompanied the publication of Ofcom's Final Report: "competitive market forces are delivering benefits to customers – especially where providers are competing to attract new customers – in the form of innovative products and discounts."[2] We agree, and as a customer-obsessed company, we welcome the benefits that a competitive IT industry brings to customers. For example, we have reduced prices at least 129 times since launch, and other providers have similarly introduced price reductions over time. AWS has also been at the forefront of cloud innovation by introducing new services to meet customers' needs, often built on innovative technologies that underpin an extremely fast, secure, and resilient global network for our customers to transfer data. We are not alone when it comes to

[1] According to Gartner, an estimated USD 4,500 billion was spent on IT in 2022 (https://www.gartner.com/en/newsroom/press-releases/2023-10-18-gartner-forecasts-worldwide-it-spending-to-grow-8-percent-in-2024) and of that amount, cloud spending constituted USD 478 billion (https://www.gartner.com/en/newsroom/press-releases/11-13-2023-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-reach-679-billion-in-20240#:~:text=Worldwide%20end%2Duser%20spending%20on,latest%20forecast%20from%20Gartner%2C%20Inc.).

[2] See https://www.ofcom.org.uk/news-centre/2023/ofcom-refers-uk-cloud-market-to-cma-for-investigation.

innovation in response to competition and customers' needs; competition in the overall IT industry is more innovative and dynamic than ever before.

4. The Issues Statement sets out to test four potential hypotheses in which cloud services providers might create barriers for customers to switch or use multiple suppliers, namely by (1) having technical restrictions on interoperability that prevent some of their services from working effectively with services from other providers; (2) charging "egress fees" for data transfers out of a cloud service to the Internet; (3) offering volume discounts – or, as the CMA (borrowing the terminology of Ofcom's Final Report) refers to them, "committed spend discounts" – as an incentive for customers to use a single provider for most or all of their cloud needs and (4) imposing unfair licensing conditions which prevent competition on the merits.

5. We note that the CMA is in the early stages of its assessment and, as such, these hypotheses understandably reflect Ofcom's Final Report to a large extent. However, we believe that the first three of these hypotheses are based on fundamental misconceptions about the IT sector, global networking technology, the actual interoperability of IT services, and discounts on offer, and that in the course of its market investigation the CMA will find that none of them holds, in particular in relation to AWS. Rather than inhibiting customer choice, the cloud has made switching between IT providers easier than ever before, and AWS has been at the forefront of developing technical solutions to make it easier to transfer data and workloads across different IT providers. Indeed, despite significant methodological flaws in the design and interpretation of the market research it conducted – many questions suffered from bias – even Ofcom's own surveys showed that the majority of customers use multiple cloud services providers, and of those who do, the vast majority found that it was not difficult to do so.

6. To assist the CMA, we provide below our views on competition for IT services and on the ability of customers to switch between and use multiple suppliers. We then address the misconceptions behind the hypotheses raised about "egress fees", interoperability and "committed spend discounts", as well as AWS's observations in relation to certain software licensing practices (addressing the CMA's fourth hypothesis).

<u>IT services are highly competitive and switching between them is easier than ever.</u>

7. As the CMA will see through the evidence collected in its market investigation, by every metric, IT services—whether delivered on premises or over a network—are a highly competitive sector, and competition is only increasing. This has lowered prices, encouraged innovation, and increased the total usage of IT services, all of which has led to economic growth.

(A) Cloud services providers compete with each other and on-premises providers

8. The overall IT sector continues to grow, as customers look to explore alternative IT solutions in order to connect online with their own customers as quickly and effectively as possible. Customers are typically looking to solve a specific IT problem; they are rarely, if ever, looking simply to use "the cloud" as an end in itself. Similarly, customers don't tend to think about "Infrastructure as a

Service", "Platform as a Service", or "Software as a Service" choices. The solution for a particular IT problem may involve one or more different services, such as compute, storage and networking, working together in a specific way. Each of these components can be deployed on the customer's premises, in a co-located environment, online, and/or adopting a hybrid approach using several of these options. Within each of these environments, customers have scores of choice[3] – and often opt to use multiple providers and solutions for their various IT needs.[4] For example, a company that wants to launch a web-based fitness application would begin by defining what they need to build the application and deliver it to end-customers, which would include (amongst other things) a development platform to build the application itself, processing, data storage, a database for fitness data, networking to allow the data to flow to users and back, and payment and security. Each of these could come from different technology providers – for example, the compute could come from Dell, the storage from EMC, the database from Oracle and the development platform from Atlassian. As reflected by the fact that less than 11% of IT spending is in the cloud, the vast majority of customers continue to use on-premises IT solutions offered by providers like IBM, Dell, HPE, and Cisco, or co-located or managed services offered by a broad range of providers, including Equinix, NetApp, and Digital Realty.

(B) New and existing cloud services providers are creating more competition in the IT industry, leading to less concentration.

9. Since AWS's launch in 2006, cloud services have become mainstream, and competition to provide cloud services as an additional, lower-cost solution to meet customers' needs is only increasing. To name just a few, Google (2008), Microsoft (2010), Rackspace (2010), IBM (2011), Dell (2011), OVHcloud (2011), DigitalOcean (2012), UpCloud (2012), Aruba (2014), HPE (2015), Oracle (2016), Deutsche Telekom (2016), Cloudflare (2018), and Flexential (2019) have all begun offering cloud services, and the list is growing rapidly.

10. <u>These competitors are growing rapidly.</u>

(a) According to IDC data, the number of cloud services providers with half-year revenues in the UK above $20 million nearly tripled between the first half of 2017 and the first half of 2023, and the number of cloud services providers with half-year revenues above $5 million more than doubled.[5]

(b) Over the same period, 77 firms doubled their semi-annual revenues in the UK to reach levels above $20 million and 202 firms doubled their semi-annual revenues to reach levels exceeding $5 million by the first half of 2023.[6]

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[3] For instance, according to IDC's "Worldwide Semiannual Public Cloud Services Tracker", there are over 900 providers of public cloud services alone.

[4] Flexera's State of the Cloud Report (2023) notes that 87% of organizations multi-cloud, with most (72%) adopting a hybrid approach combining the use of both public and private clouds.

[5] IDC's "Worldwide Semiannual Public Cloud Services Tracker", H1 2023 and H1 2022.

[6] *Ibid*.

(c) Specific examples of double-digit growth in recent years (2019-2023) include Salesforce (CAGR[7] 20%), Oracle (CAGR 24%), Workday (21%), ServiceNow (24%), OVHcloud (22%), Cloudflare (47%) etc. Total growth of these providers over the past four years ranges is several hundreds of percent.[8]

(d) In addition to cloud services providers, there are also thousands of providers of software services that are delivered on-demand to meet customers' IT needs, including the competitors listed above, Salesforce, Adobe, SAP, and more. With these entrants, AWS represented less than 2% of global IT spend,[9] and – according to IDC – only 13.5% of the global public cloud segment in 2022, despite our significant head start as the original innovator in this space.[10]

(C) Falling prices and rapid innovation are benefiting customers

11. As competition has intensified, the prices of cloud services have fallen.

(a) AWS has implemented at least 129 price reductions globally since its launch in 2006. These price reductions have occurred even as AWS has improved quality and performance. Newer servers get more work done in less time, compounding the savings—customers get more and pay less. In particular, we have implemented significant price decreases for its primary compute product (Elastic Compute Cloud, or EC2), including in 2017, 2020, and 2022, and on Simple Storage Service (or S3), including in 2016 and 2021.[11]

(b) IT providers, including new entrants, must compete on pricing in order to attract customers. Cloud services providers also compete with each other and with on-premises providers by offering free tiers, which allow free usage up to a certain threshold for many services. For instance, we introduced the Free Tier in 2010, which today provides free usage of more than 100 AWS services up to specified limits. This includes the dramatic expansion of free data transfers out from our network from 1 gigabyte per month to 100 gigabytes per month as of December 2021.[12] Other providers have followed suit with

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7 Compounded Annual Growth Rate.

8 IDC's "Worldwide Semiannual Public Cloud Services Tracker", H1 2023 and H1 2022.

9 Based on Gartner reporting of worldwide IT spending in 2022: https://www.gartner.com/en/newsroom/press-releases/2023-10-18-gartner-forecasts-worldwide-it-spending-to-grow-8-percent-in-2024.

10 IDC's "Worldwide Semiannual Public Cloud Services Tracker", H2 2022.

11 See https://aws.amazon.com/blogs/aws/ec2-price-reductions-reserved-instances-m4-instances/; https://aws.amazon.com/blogs/aws/ec2-price-reduction-for-ec2-instance-saving-plans-and-standard-reserved-instances/; https://aws.amazon.com/about-aws/whats-new/2022/06/price-reductions-amazon-ec2-instances-suse-linux-enterprise-server-sles-os/; https://aws.amazon.com/blogs/aws/amazon-s3-glacier-price-reduction/; https://aws.amazon.com/blogs/aws/aws-storage-update-s3-glacier-price-reductions/.

12 See https://aws.amazon.com/blogs/aws/aws-free-tier-data-transfer-expansion-100-gb-from-regions-and-1-tb-from-amazon-cloudfront-per-month/. This also includes 1 terabyte per month of free data transfer from Amazon CloudFront to the Internet.

their own "free tiers" to keep up, including Microsoft and Google following AWS's expansion of the data transfer free tier to 100 gigabytes in 2022.[13]

(c) By reducing customers' costs and providing near instant access to sophisticated IT services at the scale customers need, cloud services generate savings that can be reinvested in customers' businesses for R&D, job creation, and other benefits. According to one study, AWS's services reduce customers' IT infrastructure costs by an average of 20% relative to alternative IT solutions[14] and reduce the time to develop new software, speeding products to market and making it easier to experiment with new products. Public First has found that 84% of AWS customers in the UK report that cloud services have made it easier to innovate and launch new products.[15]

12. Competition has also led to increased innovation.

(a) For example, we developed the AWS Nitro System, with specialized hardware that enables high speed networking, enhances security, and allows us to rapidly deliver Amazon EC2 instance types with an ever-broadening selection of compute, storage, memory, and networking options. AWS also developed AWS Graviton, AWS Trainium, and AWS Inferentia processors, which power Amazon EC2 instances with up to 40% better price performance than comparable Amazon EC2 instances with significant improvements in energy efficiency. Each generation of this hardware offers increasing levels of performance, lower cost, and power efficiency for a diverse range of customer workloads.

(b) Additionally, for many years we have innovated in designing purpose-built hardware (*e.g.*, for servers, motherboards, solid state drives and networking switches) that provide customers with the lowest cost access to the entire hardware setup, instead of relying on generally available, costly, over-featured hardware that is not purpose-built for cloud workloads. Other IT providers are developing similar solutions, to the ultimate benefit of customers.

(D) Cloud services have made it easier than ever to move data and switch providers

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[13] See https://azure.microsoft.com/en-us/pricing/details/bandwidth/ (showing Azure data transfer pricing to be free for first 100 gigabytes per month); https://www.oracle.com/a/ocom/docs/cloud/oci-vs-azure.pdf (Oracle document from March 2022 showing Azure to offer 5 gigabytes of free data transfer at the time); https://cloud.google.com/storage/pricing-announce (describing Google's expansion of free data transfer to 100 gigabytes).

[14] Hackett Group, The Business Value of Migration to Amazon Web Services (Feb. 2022) at pp. 3-5 (demonstrating savings in infrastructure from migrating to cloud), https://pages.awscloud.com/rs/112-TZM-766/images/hackett-group-the-business-value-of-migration-to-aws-012022.pdf.

[15] Public First, The Impact of AWS in the UK in 2020, available at: https://awsimpactreport.publicfirst.co.uk/.

13. Multi-clouding and hybrid-clouding are popular. Indeed, the Flexera 2023 "State of the Cloud" Report found that 87% of its respondents used multi-cloud.[16] Similarly, 98% of respondents to Oracle's "Multi-Cloud in the Mainstream" report currently use or plan to use more than one cloud service provider.[17] According to Gartner, more than 80% of customers use multiple IT providers for different workloads and purposes.[18]

14. As evidenced by these figures, a customer that chooses a cloud services provider for a particular workload need not choose the same provider for another workload. Both to respond to customer demands, as well as to compete for additional customer workloads, AWS offers technical solutions that make it easier to transfer data and workloads to and from AWS, such as Database Migration Service, DataSync, and Snowball.[19] In recent years, we've also invested millions in customer migration programs to help lower the costs that are inherent to switching IT providers. Our competitors also offer their own transfer services, such as Azure Migrate, Google Database Migration Service, and Oracle Cloud Migrations, as well as their own programs to help facilitate switching.[20] Finally, there are tens of thousands of other IT companies, including Accenture, BMC, Capgemini, and Deloitte, that partner with AWS to offer migration and other services directly to AWS customers. These partners often maintain relationships with other providers and facilitate customers switching away from AWS.[21]

15. AWS's own experience reinforces the conclusion that customers regularly switch between IT providers. For example:

    (a) Netflix migrated its streaming services away from its own data center to AWS to take advantage of the scalability of the cloud, reduce outages, use our global network and reduce costs.[22]

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[16] See https://info.flexera.com/CM-REPORT-State-of-the-Cloud. This included organizations from across the world who purchased services categorized as "IaaS, PaaS and SaaS".

[17] See https://www.oracle.com/a/ocom/docs/gated/451-research-multicloud-in-the-mainstream.pdf.

[18] See https://www.gartner.com/smarterwithgartner/why-organizations-choose-a-multicloud-strategy.

[19] See https://docs.aws.amazon.com/dms/latest/userguide/CHAP_Introduction.Targets.html (showing that customers can select an on-premises database as the target when using Database Migration Service); https://aws.amazon.com/datasync/faqs/ (stating that DataSync "supports moving data to, from, or between" a number of AWS systems and confirming that DataSync can copy data off of S3 and to either on-premises or other cloud services providers); https://docs.aws.amazon.com/snowball/latest/ug/transfer-export.html (describing the process of transferring data off of AWS with Snowball).

[20] See https://cloud.google.com/database-migration; https://cloud.google.com/storage-transfer-service; https://cloud.google.com/transfer-appliance/docs/4.0/overview; https://docs.oracle.com/en-us/iaas/Content/cloud-migration/cloud-migration-overview.htm.

[21] For example, Databricks Lakehouse runs on Azure, AWS, and GCP, and Accenture provides consulting services, including how to design a multi-cloud solution, and partners with AWS, Azure, and GCP.

[22] See https://about.netflix.com/en/news/completing-the-netflix-cloud-migration (describing Netflix's migration to AWS).

(b) Dropbox, on the other hand, moved much of its data out of AWS to its own network of servers, in a switch from the cloud to a hybrid on-premises and cloud solution.[23]

(c) Walmart has also moved from the cloud to a hybrid solution by building its own network of servers to "switch seamlessly between cloud providers and its own servers."[24]

(d) Zynga, a mobile game developer, switched from AWS to its own private cloud, but ultimately brought workloads back to AWS when it realised it could benefit from AWS's continuous investment and innovation in hardware and other services.[25]

(e) FirstGroup plc,[26] a provider of transport services in the UK and North America, migrated workloads to AWS from on-premises and from a competing cloud services provider to improve performance and reliability.

Contrary to Hypothesis 1, customers have the ability to switch between cloud service providers and multi-cloud

16. Ofcom's Final Report claimed that there are technical barriers to switching and to using multiple suppliers, which have an adverse impact on customers, and that these barriers may be exacerbated by certain practices employed by cloud services providers to limit interoperability. This view is fundamentally flawed. In fact, even Ofcom's own survey evidence shows that 79% of customers consider that "interoperability" is not a challenge to switching and 76% of customers consider that "data charges" are not a challenge to switching.[27]

17. First, multi-clouding, integrating IT solutions, and switching between IT providers is far more prevalent than Ofcom's Final Report suggested, and has never been easier for IT customers to do.

(a) Prior to the introduction of on-demand IT services by AWS, switching IT providers was often a prohibitively expensive, multi-year process. Legacy IT customers were, and in many cases still are, bound by the many millions of dollars spent on on-premises infrastructure hardware, limited to only using software that was compatible with their infrastructure hardware, and subject to restrictive licensing terms. When AWS pioneered the provision of IT services on demand over the internet (so-called "cloud services"), a key component was providing customers with the flexibility to design their solutions to meet their needs, including moving between, and interoperating across, different IT

[23] See https://dropbox.tech/infrastructure/magic-pocket-infrastructure; https://www.wired.com/2016/03/epic-story-dropboxs-exodus-amazon-cloud-empire/ (discussing Dropbox's transition from cloud to a hybrid solution).

[24] See https://www.wsj.com/articles/walmart-amps-up-cloud-capabilities-reducing-reliance-on-tech-giants-11656000000 (discussing Walmart's transition from cloud to a hybrid solution).

[25] See https://aws.amazon.com/solutions/case-studies/zynga/ (describing Zynga's migration away from and back to AWS).

[26] See https://aws.amazon.com/solutions/case-studies/firstgroup/.

[27] Ofcom Final Report, para. 5.153; and Context Consulting market research, Question 52.

environments. AWS was the first IT provider to offer pay-as-you-go pricing, creating an immediate reduction in the cost and burden of switching providers and solutions. According to a recent study, 84% of AWS customers in the UK report that cloud services have made it easier to innovate and launch new products.[28]

(b) Ofcom's own market research indicated that multi-clouding and hybrid-clouding are popular approaches and are well used – 52% of respondents using services categorized by Ofcom's Final Report as "IaaS/PaaS" stated that they use more than one cloud provider,[29] and 54% that they use both public and private cloud.[30] Furthermore, looking at the remaining 48% who only use a single cloud provider, the overwhelming majority (86%) are open to using multi-cloud architecture in the future. Taken together, the answers to these questions mean that the overwhelming majority of customers (93%) are either using multiple providers (52%) are consider doing so in the future (41%=48%x86%). In the response to question 36 of the Public First survey, only around 11% of respondents stated they are unlikely to change providers because it would be "too complicated". Around 80% stated they would not change because they are satisfied with their current provider. [31] Indeed, Ofcom's market research underestimates the actual popularity of multi-clouding and switching, because it incorrectly fails to account for hybrid uses of on-premises and cloud services. According to Gartner, already in 2020, 78% of UK survey respondents worked with "multiple infrastructure as a service (IaaS) providers."[32]

(c) Evidence from the Public First survey shows that cloud services providers, including AWS, face significant competitive pressure from on-premises providers. In particular, of surveyed UK organizations that have ever switched from cloud infrastructure providers, 29% switched to on-premises services. Such a high switching rate demonstrates the substantial competitive pressure of on-premises services on cloud services providers. This means that the collective competitive constraint of on-premises providers on cloud services providers can be estimated to be at least as strong as any cloud services provider including AWS, Azure, and Google Cloud Platform.[33]

18. Second, in particular AWS supports interoperability and is incentivized to do so by customer demands and preferences:

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[28] Public First, The Impact of AWS in the UK in 2020, available at: https://awsimpactreport.publicfirst.co.uk/.

[29] Ofcom Final Report, paragraph 4.52.

[30] Ofcom Final Report, Figure 3.7. See also paragraph 13 above for additional statistics on multi-cloud. CRA analysis using Context Consulting market research data, Questions 23 and 30.

[31] Public First carried out a survey of 1,001 senior IT business decision makers between 25 May 2023 and 1 June 2023 that are either already cloud customers or are considering using the services in the future. The survey is available at: https://www.publicfirst.co.uk/files/CCIA_Survey.xlsx.

[32] See https://blogs.gartner.com/rene-buest/2021/07/27/the-u-k-cloud-migration-governance-and-cost-control-are-%20%20the-most-frustrating-aspects-of-public-cloud/.

[33] Public First, Poll for CCIA (Cloud Users) (2023), Question 31, available at: https://www.publicfirst.co.uk/files/CCIA_Survey.xlsx.

(a) Customers demand the ability to use multiple IT solutions and to switch workloads among them. In fact, a key consideration for customers moving to the cloud is ensuring interoperability with existing IT solutions, and this factors into customers' decisions about which IT providers to use. AWS works to continually *increase* interoperability, not limit it, because that is what customers want. Rather than locking customers into a specific solution, AWS's incentive is to offer a range of different services, enabling customers to choose the solutions that are right for them. We continuously update and refine our products and services to keep pace with evolving technologies and standards. AWS customers that choose to purchase an IT solution based on our compute, storage and networking services can build their own software in a manner that is completely cloud agnostic and transportable, using a wide variety of industry-standard technologies, such as open-source projects (*e.g.* Linux, Xen, containers), open standards (*e.g.* storage formats like JPEG), and open APIs (*e.g.* the S3 API).

(b) For example, many customers choose to run their applications on EC2 virtual machines using widely available and supported operating systems such as Linux or Microsoft Windows. The nature of IT means that making any configuration changes does incur some cost, but the costs of switching a virtual machine from one environment to another are relatively low. Other customers choose to, instead, use containers, which are another form of software packaging that is lighter weight than virtual machines and provides higher velocity for deploying software. Containers are built on open-source standards and supported across on-premises and cloud environments, and customers can run their containers everywhere they run their software (including in their own data centers, on AWS and on other cloud services providers). Containers also often benefit from additional management and orchestration capabilities assisting customers in how to deploy and run the containers; for example, AWS has multiple services offering such capabilities, such as Elastic Container Service ("**ECS**") and Elastic Kubernetes Service ("**EKS**"). Customers can also run their own open-source-based services providing these capabilities on AWS, such as open-source Kubernetes. Customers can switch to/from these various options and even switch to/from their own data centers and other cloud services providers as they adapt their products and services to best serve their business needs.

(c) If customers find that innovative AWS services that include proprietary technology better suit their business needs, they are free to choose these AWS IT services – this decision is entirely up to them and is no different from software-buying decisions that companies make every day when building new IT applications. We offer flexibility, and our customers make the choice.

19. We lead or support hundreds of open-source solutions and makes its software development kits (**"SDKs"**) publicly available.[34]

[34] See, for example, https://aws.amazon.com/opensource/?blog-posts-content-open-source.sort-by=item.additionalFields.createdDate&blog-posts-content-open-source.sort-order=desc.

(a) As recognized by Ofcom, open-source technologies provide customers with more choice and can lower barriers to switching.[35] As a result, working with multiple cloud and other IT providers, and switching among them, is both prevalent and far easier than ever before. AWS leads or supports hundreds of open-source projects.[36] For example, AWS is now a top 4 contributor to PostgreSQL[37] and the largest external contributor to MariaDB.[38] We make many of our SDKs and APIs publicly available under open-source licenses; use open protocols, interfaces, APIs, and data formats across services; and publish extensive documentation, including, where relevant, differences between the AWS services and the underlying open-source. We also help customers design their IT processes for "reversibility" to easily adapt to another IT environment.[39]

(b) APIs for Amazon S3 are publicly made available under open-source licenses. This approach has enabled the Amazon S3 APIs to be copied by many IT providers including Google,[40] IBM,[41] and Oracle,[42] and Microsoft recommends that customers use publicly available third-party code that implements the Amazon S3 APIs.[43] Each of these providers (as well as Linode Object Storage,[44] DigitalOcean Spaces,[45] Wasabi,[46] and Vultr[47]) actively markets these APIs to promote customer migration from AWS to their competing storage services. As another example, the AWS Encryption SDK, which makes it easy for customers to encrypt and decrypt their cloud-stored data, can also be used with other IT environments because it is distributed at no cost under an open-source license. This allows customers to use the SDK to build encryption solutions that work both on AWS and other IT environments. We often provide our own alternatives alongside open-source options, which simply provides more choice—customers are free to select from a menu of options based on what is most important to them.

(c) One suggestion raised by Ofcom was with regard to the mistaken proposition that AWS increases technical barriers to switching and interoperability by tweaking services built on open-source technology such that customers wanting to switch need to rewrite much

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35 Ofcom Final Report, paragraph 8.17(c).

36 See, for example, https://aws.amazon.com/opensource/?blog-posts-content-open-source.sort-by=item.additionalFields.createdDate&blog-posts-content-open-source.sort-order=desc.

37 See https://www.enterprisedb.com/blog/importance-of-giving-back-to-postgresql.

38 See https://mariadb.org/mariadb-contribution-statistics-march-2023/.

39 AWS Whitepaper, Unpicking Vendor Lock-In, https://docs.aws.amazon.com/pdfs/whitepapers/latest/unpicking-vendor-lock-in/unpicking-vendor-lock-in.pdf.

40 See https://cloud.google.com/storage/docs/migrating#overview.

41 See https://cloud.ibm.com/docs/services/cloud-object-storage?topic=cloud-object-storage-compatibility-api.

42 See https://docs.cloud.oracle.com/en-us/iaas/Content/Object/Tasks/s3compatibleapi.htm.

43 See https://devblogs.microsoft.com/cse/2016/05/22/access-azure-blob-storage-from-your-apps-using-s3-api/.

44 See https://www.linode.com/blog/cloud-storage/s3-compatible-object-storage-for-your-business/.

45 See https://docs.digitalocean.com/products/spaces/resources/s3-sdk-examples/.

46 See https://wasabi.com/s3-compatible-cloud-storage/.

47 See https://www.vultr.com/products/object-storage/.

of their code.[48] We do not do this. We offer managed services for popular open-source software which provide customers with more options for running their open-source workloads ("managed open-source services"), such as Amazon OpenSearch Service, Amazon EMR, Amazon EKS and Amazon RDS. Some customers prefer to use managed open-source services because they don't want to focus on the administrative effort involved in running and maintaining secure, up-to-date open-source software. While managed open-source services include plug-ins that integrate with other AWS services, changes to the underlying open-source are documented[49] and do not prevent customers from easily transitioning to their next solution. The open-source portion of an application almost always requires various integrations and connections to other software that enable a full-featured application, regardless of where customers choose to run their open-source software. In other words, nothing about our managed open-source services raises technical barriers to switching. Our services built on open-source, like OpenSearch,[50] add to, but do not supplant, the upstream open-source projects. In fact, competitors like Oracle,[51] Instaclustr[52] and Aiven[53] have built managed open-source services based on OpenSearch, further increasing the competition for customers who use this AWS-supported open-source project. Further, contrary to Ofcom's concern around transparency, AWS already takes many active steps to inform and educate its customers, explaining the programming language behind various tools that can be used to build on AWS[54] and documenting the changes to the underlying open-source of its managed open-source services.

20. Skills are generally transferrable between cloud services providers and there are many free and paid options for IT users to develop their skills with different IT providers.

(a) IT developers and engineers must frequently learn the nuances of new technologies, services, and projects, so their skillsets are portable and adaptable to other IT solutions. While some retraining may be necessary any time a new service or technology is adopted, it is relatively easy for professionals to apply knowledge of one cloud to another and to transfer between cloud services providers. AWS in particular, as well as other cloud services providers support open-source technologies and industry standard protocols, further contributing to skill portability. For example, we allow third parties to use AWS APIs and SDKs that are compatible with multiple commonly used programming languages outside of AWS.

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48 Ofcom Final Report, Paragraph 5.87.

49 See for example: https://docs.aws.amazon.com/neptune/latest/userguide/feature-overview-standards-compliance.html; https://docs.aws.amazon.com/keyspaces/latest/devguide/keyspaces-vs-cassandra.html.

50 See https://github.com/opensearch-project/OpenSearch.

51 See https://docs.oracle.com/en-us/iaas/Content/search-opensearch/home.htm.

52 See https://www.instaclustr.com/platform/managed-opensearch/.

53 See https://aiven.io/opensearch.

54 See https://aws.amazon.com/developer/tools/?nc1=f_dr.

(b) Furthermore, there are many free and paid options for IT users to develop their skills with different IT providers. These include training resources from cloud services providers, as well as training from independent providers that cover multiple IT providers. Other cloud services providers, including those that do not fall under Ofcom's "hyperscaler" label, offer training courses that make it easy for IT professionals to hone their skills for their services.

(c) Retraining isn't a barrier to companies switching cloud services providers or multi-clouding, in part because customers invest in IT training whether they are switching to a new IT provider. Many AWS customers use AWS's free offerings to increase their workforce's overall cloud-based skills. For example, the AWS training and certification ("**AWS T&C**") team built a training initiative to teach foundational cloud knowledge to Principal Financial Group's workforce, helping to upskill 1,650 employees.[55]

21. Certain adaptations when moving between IT solutions are inevitable, however they are lower than ever before.

(a) Of course, even with the addition of cloud services to the IT industry, moving data and changing IT services still naturally takes some time and resources. For example, to move an application (which could have many complex, inter-connected components, from databases to data warehouses, security, networking and many other elements and dependencies) between providers, a customer may need to train their employees on using the new services, decide whether code or configuration changes are needed, and make the necessary adjustments. Even replicating an application—and its data—from one data center to another can involve technical work and costs (*e.g.*, data format changes and data transfer costs).

(b) While there are inherent costs to moving data and changing IT services, on AWS, customers can design their solutions to be easily portable and interoperable between and across different IT environments. AWS builds its services to try and reduce these inherent costs, by supporting multiple operating systems, programming languages, open-source projects, and standard protocols. AWS has also provided customers with services and tools to help them significantly reduce the cost and effort needed and continues to do so. As a result, these inherent costs are lower today than ever before.

22. Finally, the IT sector is extremely dynamic and characterized by constant innovation and disruption from new and existing businesses. It is a sector marked by sophisticated customers who know what they want and employ IT experts (or external IT expert consultants) to make decisions; this creates increased scrutiny of business offerings and competitive pressure. IT providers large and small are constantly developing new technologies to meet customer needs and solve novel problems. Each offer a unique set of services and features, and compete on factors such as security, reliability, availability, scalability, and price. This innovation is what drives

[55] See https://aws.amazon.com/solutions/case-studies/principal-financial-group-case-study/.

competition in the IT sector, and in AWS's experience customers rank the quality of service as a key driver for choosing their IT providers. Customers know that no single cloud services provider is a "one-stop-shop", offering native IT solutions for every use-case, and they therefore demand the flexibility to incorporate third-party technology and services into their cloud solutions. If customers are not confident that they will be able to do so when the next innovation is released, or when they need a niche solution, they will not choose AWS to begin with. AWS and other cloud services providers therefore design many of their services to be interoperable with other solutions by using open technology and industry standards, as customers demand the ability to benefit from the innovative solutions offered by different providers.

Hypothesis 2 is based on an erroneous understanding of data transfer fees

23. While AWS cannot comment in respect of other cloud service providers, we do not charge "egress fees"—that is, for switching data to another IT provider. We charge a service fee for using our network to transfer data within or out of AWS *regardless* of the reason for the transfer or whether it is destined for a competing IT provider.[56] These fees are never based on the reason for the data transfer; indeed, our customers make hundreds of millions of data transfers each day, and we generally do not know if the data transferred out to the Internet is a normal part of a customer's business (*e.g.*, a video streaming company sending a movie to one of its users) or a customer transferring data out to switch IT providers.

24. AWS's fees for data transfer reflect the cost of building and maintaining AWS's extensive, reliable, and secure private network. These are real costs: AWS has built a first-in-class global network by investing tens of billions of dollars in proprietary networking solutions such as custom semiconductors, equipment and software, and millions of miles of terrestrial and undersea cable. These investments improve transfer speeds, reduce lag, and increase security and reliability across the entire AWS global network (ensuring 99.999% availability). The network is designed to withstand multiple overlapping failures, and all data flowing across AWS Regions is automatically encrypted before it leaves AWS's secure facilities. All of this is expensive to establish and maintain, and AWS's pricing reflects its efforts in investing in equipment and networking to provide an available, high-performing, redundant network that scales to customer needs.

25. Just as AWS has innovated to reduce the cost of its services, AWS similarly works to reduce its data transfer costs and to pass these cost savings on to its customers. AWS data-transfer-out costs decreased globally by around 31% between 2019 and 2022, and we passed the vast majority of these savings directly on to our customers by reducing fees globally by around 25% over the same period. Specifically, AWS's fees for transferring data out to the Internet fell over 30% globally between 2018 and 2022. [57] In addition, as mentioned above, we significantly expanded the free

[56] See, for example, https://aws.amazon.com/ec2/pricing/on-demand/ (showing data transfer pricing for AWS EC2).

[57] This figure excludes data transfers from AWS Edge locations via Amazon CloudFront.

tier of data transfers out from our network from 1 gigabyte per month to 100 gigabytes per month in November 2021.[58]

26. We use a common pricing model for transferring data: When customers transfer data into AWS's cloud, AWS does not charge a transfer fee. When customers transfer data within AWS or from AWS to the internet, AWS typically charges a per-gigabyte fee once the usage exceeds the 100-gigabyte free tier for transfers out to the internet.

27. Overall, this pricing model is efficient and ensures customers pay data transfer fees only for their actual network usage after consuming their free 100 gigabytes per month. AWS's pay-as-you-go model allows a business of any size to start using AWS, and the lack of fees for transferring data into AWS minimizes the costs of beginning to use IT services and promotes adoption of cloud services which is beneficial to both cloud customers and cloud providers. Businesses that transfer large amounts of data on a recurring basis will incur greater fees for their usage of the AWS network, while businesses that use less of the network for data transfer will pay less.

28. Other businesses that transfer data—even outside cloud services—use the same basic model of charging customers a per-unit fee for data transfers. This includes cell-phone providers and ISPs, along with AWS's competitors offering cloud services. Compensating providers for the substantial cost of transferring data and building and operating a complex and expensive network is the only way to facilitate large-scale data transfer of the kind that customers demand.

29. Possible alternative pricing models would be substantially worse for customers: (1) A flat fee for unlimited data transfers, regardless of size, would force smaller customers to subsidize larger customers' use of network resources. (2) Requiring no fee for any data transfer would be uneconomic because cloud services providers could not provide customers with the reliable, fast, and secure global network that they require without being able to recoup the significant expenses associated with building and maintaining such a network. Customers may transfer more data than would be economically efficient, and cloud services providers would likely need to increase other fees, such as storage fees, to cover these costs. This would similarly subsidize large customers who are the primary consumers of data-transfer services. (3) Other hypothetical alternatives that would ultimately force cloud services providers to charge for transferring data into their clouds would make switching to cloud services or between clouds more costly, and would impose new data transfer costs on the vast majority of customers who today do not pay any data transfer fees at all.

Hypothesis 3 is based on misconceptions about "committed spend discounts"

30. The hypothesis that "committed spend discounts" can dampen competition by incentivizing customers to use a single provider for most or all of their needs, or that cloud services providers require customers to increase their spend commitment upon renegotiation of their agreements

[58] See https://aws.amazon.com/blogs/aws/aws-free-tier-data-transfer-expansion-100-gb-from-regions-and-1-tb-from-amazon-cloudfront-per-month/. This also includes 1 terabyte per month of free data transfer from Amazon CloudFront to the Internet.

does not hold. This hypothesis is particularly flawed with respect to the discounts that AWS offers its customers.

31. First, discounts are pro-competitive and directly benefit customers.

    (a) Discounts, savings and credits are a common business practice in most industries. Passing along efficiencies to customers helps all parties and enhances competition. As long recognized by regulatory agencies, volume discounts are generally pro-competitive, and Ofcom itself acknowledged in its Final Report that discounts are a positive feature of markets, leading to lower prices and promoting competition.[59]

    (b) In addition, volume discounts promote customer choice and switching. Together with migration assistance programs, credits, and free trials, volume discounts contribute towards lowering the initial migration costs customers typically face in switching to a cloud services provider from an on-premises solution or another cloud services provider.

    (c) As noted by Ofcom, there are efficiency reasons for discounting structures – for example to give providers greater certainty and to motivate investment in product innovation – and placing restrictions on discounting practices could lead to unintended consequences such as a weakening of the bargaining power of customers and of providers' ability to gain the commitments from customers to the extent necessary to protect investment and innovation.[60]

32. A closer look at our pricing and discounts makes it clear that they do not raise barriers to entry and expansion:

    (a) AWS prices are listed publicly on our website, and any customer can use our services at these listed prices as much or as little as they need. For customers that have business objectives that require AWS services over time and that can predict their minimum service needs, AWS provides the option to make a commitment to use a certain volume of AWS services in exchange for discounts to pay-as-you-go pricing. While the specific terms will depend on the customers' specific needs, in general, we offer discounts to reflect the commitment the customer makes with AWS. This gives customers the freedom to choose both how much of a commitment to make and how to meet it, much like our pay-as-you-go model that works for most customers. This commitment option is completely voluntary: it is just another choice AWS makes available to customers.

    (b) For AWS customers that opt to renew their commitments, AWS partners with the customer to understand their business needs to jointly determine the right commitment and corresponding discounts. We do not decrease the discounts available at renewal; renewing customers are eligible for the same discounts based on usage levels which they had previously negotiated, without any differentiation. We do not require renewing

[59] Ofcom Final Report, Paragraphs 5.245 and 5.256.

[60] Ofcom Final Report, Paragraphs 5.246 and 10.62.

customers to commit to larger volumes to preserve existing discounts. Customers may decrease or increase their commitment to AWS upon renegotiation and their discounts will be adjusted accordingly.

In line with Hypothesis 4, certain software licensing practices by cloud service providers do restrict customer choice or prevent effective competition.

33. Some IT providers, such as Microsoft, use licensing practices that restrict customer choice and make switching more difficult. For example, Microsoft changed its licensing terms in 2019 and again in 2022 to make it more difficult for customers to run some of its popular software offerings on Google Cloud, AWS, and Alibaba. To use many of Microsoft's software products with these other cloud services providers, a customer must purchase a separate license even if they already own the software. This often makes it financially unviable for a customer to choose a provider other than Microsoft. This is evidenced by the preliminary finding of a new study by Professor Jenny published on 21 June 2023,[61] which determined that the requirement for customers to rebuy existing software licenses to use them in conjunction with cloud services resulted in an estimated expenditure of approximately EUR 560 million and a cost increase of up to 80-100% for Microsoft's software compared to when there was no such requirement. Microsoft has acknowledged the concerns of customers, but rather than fix its policy so all customers can run Microsoft's software on the cloud services provider of their choice, it has prevented IT customers from being able to run Microsoft's software on specific workloads or specific cloud services providers' infrastructure. While AWS is pleased that its customers will now be able to bring their own existing Microsoft 365 licenses for use on one particular service (Amazon Workspaces),[62] this does not resolve its customers' continued concerns over general access to Microsoft's numerous other, widely-used services. These concerns will persist until IT customers are not prevented from using Microsoft's services on the IT provider of their choice. AWS supports the Principles for Fair Software Licensing,[63] and believes that the best way to eliminate unfair licensing practices for all customers is to embrace these established Principles as standard practice for the industry.

Conclusion

34. As the CMA will discover through this market investigation, businesses, and the economy overall, have benefitted from robust competition among IT providers. The cloud, and AWS in particular, has made switching between IT providers easier than ever before, which encourages vigorous competition to provide high-quality, innovative IT services at low cost. Because the cloud industry is working well, access to IT services has been democratized and even the smallest companies are now able to access advanced technology and quickly scale to compete with larger companies. This delivers benefits throughout the entire economy, as every industry experiences the growth and innovation that access to the cloud makes possible.

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61 See https://cispe.cloud/website_cispe/wp-content/uploads/2023/06/Quantification-of-Cost-of-Unfair-Software-Licensing_Prof-Jenny_-June-2023_web.pdf.

62 See https://aws.amazon.com/about-aws/whats-new/2023/08/amazon-workspaces-microsoft-365-apps/.

63 See https://www.fairsoftware.cloud/principles/.

35. AWS looks forward to engaging cooperatively with the CMA during its investigation.