CMA CLOUD SERVICES MARKET INVESTIGATION TECHNICAL BARRIERS WORKING PAPER MICROSOFT RESPONSE

1. INTRODUCTION AND SUMMARY

- (1) Microsoft welcomes the opportunity to further engage with the Competition and Markets Authority (the "CMA") on the initial and emerging views set out in the CMA's technical barriers working paper dated 6 June 2024 (the "Working Paper").
- The CMA's investigation should, in Microsoft's view, explore more rigorously the inherent (2) nature of some of the challenges it has identified. The evidence gathered in the Working Paper provides an important insight into the friction that undoubtedly exists in not just switching cloud services and integrating applications across multiple clouds but deploying any IT solution whether on premises or in the cloud. The CMA's investigation should, therefore, then turn to the extent to which customers benefit from the degree of differentiation in cloud services that gives rise to the need for customers to rework their applications before switching or integrating different cloud components and environments. By commoditising cloud services to improve the ease of switching, or introducing a lowest common denominator standard to ease crosscloud integration (*i.e.*, the types of close integration between clouds within an application and within workloads discussed by the Working Paper ("Cross-Cloud Applications"))¹, it will dampen and may even remove the benefit of switching in the first place: the advantages of a better fitting cloud services component for a customer's use case. In addition to being impractical and potentially impossible for regulation to identify the "right" standard, the intervention would restrict existing competition between cloud providers to attract customers. Different prices and contractual terms alone may not be enough to surmount even the reduced costs of switching in an idealised world without inherent challenges. Customers would face no incentive to switch. As a result, the proposed interventions are likely to fail to produce an increased degree of switching and multi-cloud. Instead, Microsoft encourages the CMA to consider a framework of in-market mechanisms that could marshal already existing collective industry effort in the right places, rather than artificially tipping a delicate ecosystem through inorganic intervention.

1.1 Microsoft agrees that the inherent complexity in designing and maintaining IT infrastructure creates friction, both real and perceived, that customers face when switching and or deploying multi-cloud.

- (3) Microsoft acknowledges the customer voices given prominence in the Working Paper on the issue of technical barriers, alongside the Cloud Services Market Investigation Qualitative Customer Research by Jigsaw dated May 2024 (the "**Jigsaw Research**").
- (4) Microsoft recognises the inherent friction customers face in developing sophisticated and powerful IT solutions, migrating solutions to the cloud, and even switching between cloud service providers ("**CSPs**") or integrating applications across multiple clouds even after they have deployed to the cloud. Indeed, this recognition drives Microsoft's investments in new innovations to mitigate those difficulties, such as Microsoft Fabric, Azure Arc, and Radius.

¹ Working Paper, paragraphs 3.17 to 3.18. The use of "cross-cloud" in the defined term adopted in this response is intended to convey a higher degree of integration and interdependency than is implied in a mere reference to "multi-cloud", as the latter would also include what the Working Paper describes as "siloed multi-cloud" and "integration for management", *i.e.*, no integration or only at the level of control/observability planes.

Microsoft is motivated and incentivised to create these solutions to meet customer demand for multi- and hybrid cloud solutions, helping customers connect their on-premises workloads with the cloud and enabling deployment of workloads on multiple clouds.

- (5) This effort is not confined to just Microsoft, but is also assumed by other CSPs (*e.g.*, Google Anthos) and, more impactfully, the broader open-source community at large. It is no coincidence that one of the most meaningful innovations in facilitating cloud application portability, Kubernetes, is an open-source initiative. For this very reason, Microsoft makes significant contributions to open-source projects including efforts like Radius and Paraglider: for a sustained period of many years, it has been either the largest or second largest contributor.²
- (6) It is common ground that there is some degree of friction. The Working Paper's analysis, however, is not yet sufficiently grounded or balanced before it goes on to consider potential interventions.

1.2 Before turning to "cures" to reduce friction, there is more work to do on "diagnosis"

- (7) Concretely, the analysis does not fully explore two key related questions, which are critical in informing the threshold question: is there an adverse effect on competition ("AEC"):
 - (a) What are the benefits arising from the extent of differentiation in CSPs' services, and to what extent do they counterbalance the friction in switching and integrated multicloud? (the "Innovation Question")
 - (b) Is there less switching or integrated multi-cloud than should be expected from a wellfunctioning market? (the "**Counterfactual Question**")

The Innovation Question

(8) As to the Innovation Question, the Working Paper does not consider the extent to which customers of cloud services benefit from differentiated services, nor does it fully grapple with the trade-off implied by abstraction,³ or other approaches with the same intent: the elimination of differentiation in favour of portability. Customers of cloud services are businesses, with IT professionals and developers who make sophisticated commercial and technical decisions. The dynamism and speed of evolution in the cloud services market comes precisely from the vibrant offering of differentiated services: solutions that offer competitive edges to customers for specific use cases, achieving similar ends but in different ways that may suit one use case better than another. For example, even in IaaS, where the Working Paper supposes a lesser degree of differentiation and a greater degree of commoditisation, the choice between Azure Blob Storage and AWS S3 presents a customer with a different set of advantages for a given use-case. Dictating that one approach over the other would eliminate differentiation and customer choice when multiple abstraction layers already exist that work across Azure and AWS if customers want a maximally portable solution. Indeed, Microsoft innovated and developed Azure Blob Storage *directly in response* to S3 and its initial popularity in the early stages of the cloud services market to provide customers with a choice. Customers make informed decisions about which services are best for their solution, taking into account portability, multi-cloud, and a host of other factors.

² See <u>https://opensourceindex.io/</u> and <u>https://www.freecodecamp.org/news/the-top-contributors-to-github-2017-be98ab854e87</u>.

³ The Oxford English Dictionary, in defining the term "abstraction" as intended in this sense, provides the definition as: "the process of isolating properties or characteristics common to a number of diverse objects, events, etc., without reference to the peculiar properties of particular examples or instances."

- (9) It is, therefore, hard to see how the proposals set out in the Working Paper will result in a net improvement for customers. Some proposals, such as mandatory technical standards, would represent a highly consequential, long-lasting intrusion not just to Microsoft, but to every present and future member of the cloud services ecosystem. If differentiation is flattened, then the competing services would become commoditised, and customers would have access to a less powerful and innovative cloud, with the only potential benefits being better theoretical negotiating power because of the perceived reduction in friction when moving between clouds and lower switching costs. However, customer research is clear that prices already are going down and customers are already able to negotiate aggressively for discounts.
- (10) As noted above, the cost of switching will always be at least as high as the "house move"⁴ complexity stemming from the nature of the IT infrastructure developed by the customer. The prevalence of switching and multi-cloud may therefore *not increase* much as a result of the proposed interventions against the expected costs. What is more, if CSPs are disincentivised to differentiate, future innovation in the UK is stifled. A CSP would not risk deviating from an imposed standard with a new innovative solution. If anything, a greater improvement in the likelihood of switching lies in the *promotion* of *more* differentiation and specialisation in CSPs' services.
- (11) This is all before considering the effect of unintended consequences, which could further decrease the present and future benefits of switching.

The Counterfactual Question

(12) As to the Counterfactual Question, in its Updated Issues Statement, the CMA sets a ceiling and a starting point for the "right" amount of switching and multi-cloud:⁵

"In well-functioning cloud services market(s), we would not expect every customer to split its workloads across multiple providers in a highly integrated manner, or to switch provider every year. Rather, we would expect customers to be able to choose between a range of alternatives and to be able to multicloud and switch between products/providers. We note that customers may still face some sources of friction when exercising their choice of cloud provider, even in a well-functioning market, due to any intrinsic features."

(13) This is a welcome initial constraint to the analysis in the Working Paper, which in places observes CSPs' failure to "entirely" mitigate a particular friction without assessing whether to do so is even feasible.⁶ Microsoft encourages the CMA to further explore the "*intrinsic features*" side of the equation. IT infrastructure is intrinsically complex. Developing a cloud-native solution, like Netflix, Snapchat, or iCloud, benefits from cloud innovations, but involves inherent complexity such that moving the solution or designing it to be maximally portable is not desirable or commercially viable. Customers, developers, and CSPs each face inescapable trade-offs in light of finite resources. No participant in the cloud services market exists in a commercial vacuum where it is feasible to pursue any permutation of the possible, regardless of the value. The evidence base presented in the Working Paper does not adequately account for this, and simply believes intervention can make this "better" without sufficiently considering the significant downsides or whether the modest "improvements" in the ability to switch or adopt multi-cloud architectures changes any behaviour or market outcomes.

⁴ Jigsaw Research, paragraph 3.6.3.

⁵ Updated Issues Statement, paragraph 86.

⁶ Working Paper, paragraph 1.13: "such software does not fully overcome the challenges of using multiple public clouds and switching between them."

mean the current prevalence of switching and multi-cloud in truth reflects a well-functioning market.

(14) As noted above, the industry, including Microsoft, is already investing in seeking to reduce friction through the open-source community. Microsoft strongly believes that any interventions are more likely to succeed, and less likely to lead to unintended consequences, if they harness these existing efforts. The open-source community (which includes cloud services customers, not just providers)⁷ is best placed to understand what would (and what would not) work on these complex and technical issues.

1.3 Microsoft's preliminary proposals to *reduce* friction while limiting unintended consequences

- (15) Microsoft considers the following proposals to have merit in helping to address friction and removing some bottlenecks that have limited customer switching or multi-cloud:
 - (a) Promoting existing open-source foundations, such as the Cloud Native Computing Foundation ("CNCF"), as incubators of open-source solutions for adoption among CSPs;
 - (b) Continuing to support existing abstraction layers by *requiring* CSPs to make their APIs available to abstraction layer providers on a non-discriminatory basis, as Microsoft already does currently; and
 - (c) Improving and tailoring CSP documentation and training to give more focus on how customers can migrate workloads to that CSP, in line with the CMA's proposal.⁸
- (16) Such initiatives could not only reduce the friction for customers, but also strengthen and safeguard the role of the open-source community in finding consensus solutions to common problems, allowing any customer or ISV of any sophistication to contribute alongside CSPs towards solutions that mitigate friction.

⁷ See e.g. <u>https://www.cncf.io/about/members/</u>

⁸ Working Paper, paragraph 9.119.

2. BALANCING INNOVATION AND PRODUCT DIFFERENTIATION AGAINST EASE OF SWITCHING AND INTEGRATION

(17) In determining whether the costs of switching and multi-cloud give rise to an AEC, the analysis should assess the relationship between innovation and differentiation on the one hand, and ease of switching and integration on the other. The Working Paper currently does not fully do so. After assessing this relationship, the analysis should then consider whether the differentiation in CSP services, arising from CSPs' and open-source innovation, is of similar or greater value to customers than the expected increase in negotiating power (and the option value of lower switching costs) any lessening of the friction in switching and using multiple clouds (in particular, Cross-Cloud Applications) might deliver. If the analysis shows it is not, then this fails to indicate an AEC.

2.1 The CMA does not, as yet, quantify or balance the benefits of differentiation and innovation against the alleged harms

- (18) As explained in paragraph (8) above, the CMA's analysis does not seek to assess or credit the ability of CSPs to differentiate their offerings for the innovation in cloud services that could add to the identified difficulties in switching and multi-cloud, and the trade-off implied in prioritising ease of switching versus the value customers place in product differentiation.
- (19) Developers, when tasked by a customer to build and deploy an application, carefully consider what combination and configuration of components lead to the best performance, and continually seek to optimise that performance. How a customer judges performance is highly individual and specific to the use case. Sometimes it is speed, other times it is efficiency or as simple as a capability nobody else offers. If all CSP solutions were identical through forced, artificial coalescence around a single common standard, the benefit to customers of CSPs' innovation would be lost.
- (20) This dynamic is what the CMA has in mind when it considers loss in innovation as a risk of some of the proposals in the Working Paper. It is a serious consequence of intervention and touches on the very question of whether there is an AEC in the first place.

2.2 The CMA's assessment of CSP incentives to promote switching and multi-cloud is flawed

- (21) An important dynamic to CSPs' incentives is that it is not feasible to asymmetrically ease switching in, while artificially keeping friction on attempts to switch out.
- (22) This dynamic is important to consider in light of the shifts in sources of new workloads. The CMA recognises the reducing inflow of customers migrating to the cloud for the first time from on-premises infrastructure, and suggests that this harks the end of an era of high contestability (which would follow, if its hypothesis of an artificially depressed ability to switch CSPs were true). In other words: the CMA hypothesises the volume of newly contestable workloads is drying up, increasing the incentive of CSPs to "lock-in" customers to secure their next workload. However, this assessment is not right for the reasons set out below, which in combination suggest a future level of switching at least equal to the current prevalence, if not greater.
- (23) An application or system once created is not something customers leave untouched in perpetuity. Making architectural or functional changes, however, is not trivial, even if it does not involve changing vendor: doing so involves resources and time (and therefore opportunity costs), as well as potential disruption to the business's customers. Implementing any change runs the risk of introducing new errors, bugs and defects. This applies even to changes from, *e.g.*, one Microsoft component to another Microsoft component, as occasionally becomes

necessary once legacy services are deprecated or new, better-fitting services launch. Nonetheless, a customer's needs evolve, as well as the capabilities available in the market to fulfil those needs. Businesses using any form of IT, cloud-based or otherwise, will continually assess whether the reward for further development exceeds the costs to do so. Options at these inflection points include: (i) adapt or move the application or its components, (ii) replace it, (iii) or keep going as-is for now. This applies to anyone using IT at any stage in any environment. There is no customer "journey" to the cloud with a finish line, crossed with the "last" deployed workload. At each inflection point for each application, there is a potential for change, and therefore the potential to compete and move. In simpler terms: just because a customer has migrated one workload to the cloud, this does not signal the end of the contestability for that workload in its present or future iteration, or indeed those of other workloads that remain on-premises. As Microsoft has explained to the CMA in multiple submissions, it competes for each workload.

- (24) Indeed, a significant proportion of initial cloud migrations comprised customers "lifting and shifting" workloads from on-premises infrastructure to virtual machines in the cloud, otherwise leaving the application largely intact. This strategy only takes limited advantage of the cloud's full potential, and in time customers will consider renovating such "legacy" applications to take advantage of enhanced cloud capabilities or converting them into cloud-native or cloud-enabled applications. Again, this represents a significant inflection point.
- (25) An example of the introduction of new capabilities giving rise to an inflection point is AI.⁹ Many customers are now re-evaluating workloads to determine whether the incorporation of AI delivers a new competitive edge to their application. Indeed, incorporation of AI extends beyond such workloads and opens up brand new opportunities that may spur a client to develop a new application for a use-case that was previously commercially infeasible. [\gg]. For these customers, the benefit is sufficient to outweigh the complexity of a multi-cloud architecture in developing a Cross-Cloud Application. For Microsoft, the incentive to promote such multi-cloud integration is starkly positive: [\gg].
- (26) In sum, it is incorrect to suggest the well of newly contestable workloads is drying up, heightening the incentive to create artificial restrictions on switching or multi-cloud. To the contrary, the gradual shift in source of contestable workloads *requires* CSPs to adopt and promote multi-cloud and Cross-Cloud Application design patterns as well as facilitating application- and workload-level switching. This is evident in Microsoft's own investments: for instance Microsoft Fabric, which had not been announced at the time of Ofcom's Final Report, and Azure Arc. Both specifically target customers already in the cloud with upcoming inflection points to integrate Azure functionality in their applications.

⁹ The low prominence of AI particularly in Google's submissions to the CMA is inconsistent with its continued investment of tens of billions of dollars in AI, which places it among Microsoft and AWS in terms of magnitude of investment rather than among smaller CSPs.

3. THE CMA DOES NOT DEMONSTRATE A CAUSAL RELATIONSHIP BETWEEN COMPETITION AND THE PREVALENCE OF SWITCHING AND MULTI-CLOUD

- (27) The hypothesis threaded through the Working Paper is that a better functioning market would see more switching and a greater extent of "mixing and matching" applications across CSPs. Despite customer research detailing that the core services of Google, Amazon, and Microsoft are all roughly equivalent as each innovates and then the others quickly catch up, the Working Paper creates a hypothesis that there are instead "best of breed" features that customers want to mix and match, whether in "siloed" multi-cloud or in Cross-Cloud Applications.¹⁰ The CMA appears to assume switching and multi-cloud prevalence is an indicator of whether the market is competitive. The thesis presumes the prevalence is too low because the costs of switching and multi-cloud are too high, which in turn is *because* the market is insufficiently competitive. The argument is circular and originates in the idea that the prevalence is somehow too low. Much therefore turns on establishing whether the level of switching and multi-cloud is somehow deficient compared to expectations.
- (28) The evidence presented in the Working Paper suggests some, but not all, customers perceive difficulties in switching CSP. Likewise for developing Cross-Cloud Applications. Nonetheless, the CMA has evidence of customers that *did* switch or adopted multi-cloud architectures, so it is not a question of whether it happens at all. Ultimately this proves neither prevalence nor shortage. So why is the current prevalence of switching and multi-cloud lower than what the CMA would expect in a competitive market? What level of switching and multi-cloud would be "competitive"?
- (29) The hypothesis therefore breaks down to these two questions: (a) higher than what, and (b) how much higher?
 - (a) The CMA provides no evidence on the present level of switching and rejects quantitative evidence of the prevalence of multi-cloud. There is therefore no answer to "higher than what" other than "whatever it is now". Without knowing this, it then becomes difficult to assess whether or not this currently represents a competitive market: the unspoken but unproven assumption in the Working Paper is that it is not.
 - (b) The evidence the CMA relies on to answer the second question is entirely qualitative and, by its own admission, "mixed" and therefore inconclusive as to what level of switching or multi-cloud would represent a more "competitive market". The unspoken but unproven assumption in the Working Paper is that it is "more".
- (30) Fundamental, however, to both questions is the extent to which the market organises its own organic, unregulated efforts to ease switching and integration through the open-source community as and when it becomes technically feasible within resource constraints. A fair assessment would consider the impact this has had over time, and therefore the potential impact it may have in future, because it represents a dynamic in-market force not directly attributable to any single market participant; an unusual feature not found outside the specific context of software-related markets.

3.1 The CMA's analysis does not, as yet, address the pivotal role that open-source organizations currently play, and are expected to continue playing in future, in addressing these issues.

(31) The analysis in the Working Paper acknowledges that various open-source technologies, such as Kubernetes and Terraform, now play a role in facilitating portability and multi-cloud

¹⁰ It is worth noting that even if true, many of the proposed remedies would eliminate any such best of breed solution by requiring forced standardisation and lowest common denominator portability requirements.

architectures. The analysis, however, stops short of a crucial observation. As explained to the CMA at the Site Visit on 31 January 2024, the genesis, success and prevalence of these solutions point to a powerful in-market force: open-source foundations, in particular the CNCF.

- (32) The Working Paper largely ignores the fact that the industry is already working with these organisations to limit, where feasible, complexity and enable better interoperability and address many of the challenges identified in the working paper. For example, efforts like Radius and Dapr take aim at better application portability. Efforts like OpenAPI¹¹ assist with making interoperability easier and cloud interconnections are being advanced and improved through efforts like Paraglider.¹² Microsoft itself is a major contributor to these efforts. The Working Paper does not explain how intervention will make these efforts better, nor does it address why Microsoft has an incentive to work with them today, but can somehow lock customers in down the road in the future.
- (33) The open-source community is a large, relatively amorphous collective of professionals (from CSPs and customers alike) using and improving the software distributed on open terms. Opensource foundations provide a hub and structure to the community. Taking the CNCF, part of the Linux Foundation, as the most immediately relevant example, its charter¹³ sets out that its mission is to "*drive adoption of [the cloud native] paradigm by fostering and sustaining an ecosystem of open source, vendor-neutral projects,*" including through "*stewardship of the projects*". In particular, it sets out to:
 - (b) [Foster] the growth and evolution of the ecosystem

i. Evaluating which additional technologies should be added to meet the vision of cloud native applications, and working to encourage the community to deliver them, and integrate them if and only if they advance the general agenda.

ii. Providing a way to foster common technical standards across the various pieces.

- (34) The CNCF's role in promoting and incubating open-source solutions has become a focal point for efforts to mitigate difficulties in cloud development. In other words, it is a communitycentred effort with a pedigree of promoting effective open-source standard technologies, such as Kubernetes. The widescale adoption of Kubernetes among CSPs is in no small part explained by its incubation by the CNCF. It is no accident that other promising technologies, such as OpenTelemetry, Dapr and Radius, are also CNCF projects.
- (35) Not only does the open-source community find and collaborate on solutions to common problems, but it also provides a significant disciplining force against proprietary moats. CSPs have an incentive to contribute towards open-source projects in order to avoid being left behind when the next open-source standard is widely adopted by developers. The community-oriented nature of the effort means the standard benefits from the same dynamism as the rest of the market and receives further and organic innovation over time, in contrast with a regulatory imposed standard that freezes a particular technological snapshot in time. Customers demand these solutions and the failure to implement them will have significant commercial consequences. As the CMA research shows, customers will switch clouds if there is sufficient

^{11 &}lt;u>https://www.openapis.org/</u>

https://paragliderproject.io/. See also https://techcommunity.microsoft.com/t5/azure-networking-blog/paragliderproject-released-as-open-source-to-simplify/ba-p/4132770

¹³ <u>https://github.com/cncf/foundation/blob/main/charter.md</u>

benefit to doing so, and lacking core features like Kubernetes containers or other cutting edge cross cloud solutions, would be sufficient motivation.

3.2 A robust counterfactual for the "right" level of switching must take account of the inherent complexity in designing and deploying IT infrastructure

- (36) The Working Paper acknowledges that there is evidence of customers switching CSPs, though it has yet to quantify the current extent of switching, nor does it consider the prevalence of multi-cloud (even in the broader sense, let alone in terms of Cross-Cloud Applications) as switching. Indeed, changing the provider of the next workload is at this stage likely a more common method of "switching" than redeploying a company's entire IT estate in one big move. Nevertheless, the Working Paper explores the extent to which this level of switching is too low because the costs of doing so are too high.
- (37) This assumes a counterfactual of higher levels of switching if costs were lowered (and therefore the current level of switching is too low). In reality, the decision to switch is beset with inherent trade-offs. Undoubtedly, customers would respond positively to a hypothetical world in which the provision of IT, including switching between infrastructure providers, were easier.
- (38) A key benefit to customers of cloud services is that CSPs assume many of the complexities of infrastructure architecture and maintenance. In doing so, they take over a large set of decisions. The entire premise of cloud computing is the delegation and outsourcing of infrastructure to a third-party CSP. This frees up customers from provisioning and maintaining infrastructure, so they can instead focus on the engineering tasks closer to the core of their business. Delegation to the CSP increases from IaaS through PaaS to its highest at the SaaS level. As CSP responsibility increases, the greater the volume and import of architecture and design decisions devolved to the CSP. At its height, a CSP offers customers turnkey software with all infrastructural design and architectural decisions catered for as well as ongoing component maintenance. Put simply: customers have a choice as to the degree to which they build and manage components of their systems themselves, or are delegated to a CSP. The more that is delegated, the less complexity remains with the customer.
- (39) The CSPs' responses to those outsourced decisions are not uniform, resulting in a differentiated product market. If a customer chooses to adopt a cloud-agnostic architecture, they necessarily *re*-assume much, if not all and more, architectural complexity that had been delegated to the CSPs in the first place. See, for example, the complexity involved in developing and maintaining Walmart's Cloud Native Platform.¹⁴ This leads to the customer substituting the CSPs' choices (and therefore differentiation) with its own. The customer in effect commoditises the cloud services from the various CSPs. It must do so in order to remove the friction in switching from one CSP to the other: features achievable with one CSP must be achievable in *exactly* the same manner with the other, which precludes the use of any proprietary CSP functionality.
- (40) This has important read-across to the proposal to reduce switching costs to, or closer to, zero by reducing differentiation. By imposing such a flattening of differentiation, a regulator would make a choice on behalf of all the customers in the market: that ease of switching is always more valuable than any product differentiation. Yet this proposition is not substantiated by the evidence in the Working Paper, nor does it make sense in a market that predominantly competes on product differentiation rather than commodity features such as price or contractual terms.

¹⁴ <u>https://siliconangle.com/2023/01/17/walmarts-supercloud-cloud-native-kubernetes-based-platform-supercloud2/</u>

(41) Ultimately, customers are commercially minded businesses that view most decisions through a cost-benefit framework. Switching IT infrastructure is no different. Customers will assess the benefit of switching against the costs of doing so. This is reflected in the evidence cited in the Working Paper itself:

"Some customers said that, given the similarity of the current offerings by cloud providers from their perspective, **the value of switching is low in comparison to the costs.** Similarly, the Jigsaw report found that many customers do not see a strong argument in favour of switching." [Emphasis added]¹⁵

(42) Given the benefits to customers of differentiated solutions (described more fully below) but that in most cases the three hyperscalers' offerings are "broadly equivalent... in terms of products, features and prices", it can be expected that customers would rarely find a sufficiently large benefit in switching to justify the cost. Forcing a reduction in differentiation to make switching easier would risk reducing the benefit even further, potentially leading to the outcome that switching becomes *less* prevalent than it currently is. The counterfactual adopted by the CMA must therefore adjust the expected level of switching accordingly, and the Working Paper currently does not do so.

3.3 The CMA must establish a robust counterfactual level of multi-cloud that accounts for inherent difficulty and whether the extent of idealised "integration within applications/workloads" is actually beneficial to competition and customers

- (43) The Competitive Landscape Working Paper presented preliminary results from a heavily caveated analysis of the prevalence of all types of multi-cloud. Weighting for cloud spend, it found that 34.4% of cloud spend is by customers who have adopted a multi-cloud architecture. The CMA acknowledges that this "*analysis likely underestimates the true prevalence of multi-cloud*".¹⁶ It otherwise rejected quantitative survey analysis as to the existing prevalence of multi-cloud architecture,¹⁷ citing various criticisms as to validity, quality and coverage of respondents. Nonetheless, CSPs rely on such reports to inform their product and business strategy, and moreover each comes to an approximately similar conclusion that multi-cloud architectures are prevalent. The Annex to this response summarises these reports and the evidence of the degree of multi-cloud prevalence. In other words, the CMA has no evidence apart from the unweighted results from its own quantitative analysis to suggest that multi-cloud is *not* prevalent.
- (44) The material prevalence of multi-cloud is demonstrated by CSPs investing (significantly) in first-party solutions already on the market to facilitate and promote multi-cloud architectures to win business from rival CPSs (*e.g.*, Azure Arc, Microsoft Fabric, interoperability of Entra across platforms, Google Anthos, *etc.*).
- (45) The reality is that multi-cloud exists today and is prominent with customers where it makes commercial sense. This conclusion is no weaker for the finding that it is less prominent among customers with low spend on cloud services. It is inherently rational that this is the case: it illustrates that these customers simply do not have the cloud spend which would justify the fixed overheads of adopting a multi-cloud architecture. That does not mean, however, that they do not have credible alternatives to switch to, should they need.

¹⁵ Working Paper, paragraph 4.30.

¹⁶ Competitive Landscape Working Paper, paragraph 3.76.

¹⁷ Industry sources also confirm the prevalence of multi-cloud. Gartner recently conducted a survey and found that *"strategic adoption of multicloud remains the most common approach: 63% of respondents use multiple cloud providers."* <u>https://www.gartner.com/document/5227063?ref=solrAll&refval=419632972&</u>

- (46) The hypothesis threaded through the Working Paper is that if customers adopt a multi-cloud approach, they are more likely to change CSPs and would have better negotiating power. This hypothesis is not supported by the limited and contradictory evidence cited in the Working Paper that in fact suggests limited interest in multi-cloud architecture, especially Cross-Cloud Applications, unless there is a clear benefit from it. This is not to suggest that multi-cloud is not prevalent or weaken the evidence that it is, but rather relates to the point that it is not a course of action customers take lightly and is assessed through a cost-benefit framework just as switching is.
- (47) For example, the idea that an integrated multi-cloud infrastructure, such as Cross-Cloud Applications, makes switching easier than a "siloed" structure has no support from customer evidence, and ignores the practical and technological realities of switching that apply equally to a component *within* a Cross-Cloud Application. Just because a component in a system happens to reside with a second CSP does not make it technically easier to switch and replace.
- (48) The hypothesis centres on the notion that customers can adopt a dynamic "best of breed" approach, ignoring all the customer evidence that each of the main clouds (GCP, AWS, and Azure) have roughly equivalent features that are better than those offered by the smaller providers.¹⁸ The use cases for Cross-Cloud Applications are limited, and it is only if customers see value that they look to move workloads or run them across clouds.¹⁹ Evidence cited in the Working Paper demonstrates this use-case-dependent approach:

"Some customers said that they reviewed the option to integrate public clouds, but concluded that the benefits did not outweigh the technical costs of doing so for their current use cases. Other customers said that they viewed the benefits of integrating multiple clouds as being too low, but didn't mention whether this was in comparison to the technical costs."²⁰

"Some customers are integrating both between and within applications across multiple public clouds, therefore this suggests they saw at least some benefit to doing so."²¹

- (49) The principles outlined above, that multi-cloud and Cross-Cloud Applications are prevalent but only undertaken where there is sufficient benefit, are perfectly illustrated by the fact that [≫]. In other words, customers' applications hosted in other clouds integrate input from an Azure service when there's a clear benefit in doing so. Where customers see benefit, they will integrate, but not merely for the sake of bargaining power.
- (50) As with switching, the CMA's counterfactual whilst factoring the potential benefits of multicloud architectures (*e.g.*, additional resilience from running backup instances of a customer's application on a second cloud) - must adjust for the *inherent* challenges of multi-cloud:
 - (a) Merely provisioning a second cloud environment incurs additional management overheads, increasing the fixed cost of the business' infrastructure.
 - (b) Any application with latency sensitivity (for example, streaming, financial trading, gaming, high-volume on-line transaction processing applications) will suffer reduced performance.

¹⁸ Jigsaw Research, paragraphs 1.3.8 and 3.4.6. See also Working Paper, paragraph 4.28.

¹⁹ Jigsaw Research, paragraphs 1.3.13, 1.4.8-1.4.9, 1.4.11, 3.5.3, page 36 quote from e-commerce Google customer, 3.6.3, 4.5.8: "*Most participants do not see a strong argument in favour of a switch or a multi-cloud strategy in the first place.*"

²⁰ Working Paper, paragraph 4.15.

²¹ Working Paper, paragraph 4.17.

- (c) The introduction of a second (or third) environment by simple mathematics introduces a greater risk of application downtime: an application relying on three CSPs each offering a 99.9% uptime guarantee results in an effective 99.7% uptime guarantee.
- (51) These factors all suggest that current levels of multi-cloud adoption are not particularly low relative to what one might expect. In particular, the CMA has not established a causal relationship to suggest that the current levels are symptoms and therefore indications of an AEC, rather than merely reflections of inherent features in the market.

3.4 The CMA's evidence of harm, as yet, is anecdotal, selective and insufficiently conclusive

- (52) The evidence presented in the Working Paper is almost entirely anecdotal and is often, at its height, "mixed" as to the impact of the identified barriers. The CMA has measured perception without giving proper weight to the context: many customers will likely admit to the inherent difficulty of switching and multi-cloud if asked, but otherwise wish for an ideal world in which those difficulties did not exist. A more nuanced and proper analysis would seek customers' views of the trade-offs involved in making switching and multi-cloud "easier".
- (53) The CMA relies almost exclusively on interviews it conducted directly with customers, unweighted for the customer's technical sophistication, cloud spend, where on the spectrum it is between cloud-native, recent cloud migrant and long-time cloud user, whether and how long ago it attempted or seriously considered switching or multi-cloud. As Jigsaw observes in their methodological notes, these factors are material context to the opinions customers provide, given that "most participants mentioned these barriers in the context of hypothetical scenarios"²² (original emphasis).
- (54) The CMA's evidence is a backward-looking static snapshot that ignores the iterative dynamism of cloud services. For example, Ofcom's final report had no mentions of Microsoft Fabric, because it was still in development and had not been announced. Microsoft Fabric, alongside Azure Arc, are two important and highly relevant developments whose impacts on the barriers customers perceive may not yet be fully felt by all customers. This dynamic is recognised in the Jigsaw Research.²³
- (55) The CMA lacks serious and robust qualitative and *quantitative* evidence to substantiate the impact of the alleged technical barriers is *any greater than it ought to be* in a well-functioning market. This evidence base is therefore insufficient to justify such intrusive and wide-ranging remedies as the CMA proposes.²⁴

4. **REMEDY PROPOSALS**

(56) In light of the observations above, Microsoft considers the more onerous interventions proposed by the CMA, *e.g.*, mandatory technical standards, to be disproportionate and threaten a competitive outcome far worse than that alleged. Microsoft considers each proposal in turn below. However, in the spirit of constructive engagement, Microsoft recognises that customers perceive difficulties in switching and multi-cloud. To that end, Microsoft suggests some alternative avenues for further exploration in bringing about improvement to the customer

²² Jigsaw Research, paragraph 1.4.8.

²³ Jigsaw Research, paragraph 2.7.4.

²⁴ Tesco plc v. Competition Commission [2009] CAT 6 at [139]: "In this regard it may well be sensible for the Commission to apply a "double proportionality approach": for example, the more important a particular factor seems likely to be in the overall proportionality assessment, or the more intrusive, uncertain in its effect, or wide-reaching a proposed remedy is likely to prove, the more detailed or deeper the investigation of the factor in question may need to be." Cited approvingly in Barclays Bank PLC v Competition Commission [2009] CAT 27 at [20]-[21].

experience in cloud services. In particular, Microsoft considers that the ingredients for such improvements are already in place in the market (*e.g.*, harnessing the existing efforts and power of the open-source community): it is more a question of supporting collective industry efforts in the right places, rather than artificially tipping a multifaceted ecosystem through inorganic standards.

4.1 Microsoft believes intervention (if any) should leverage existing industry bodies to ensure solutions are workable rather than government mandated requirements.

- (57) In the event that the CMA nonetheless finds an AEC, Microsoft submits that it would be most proportionate for the CMA to limit its initial interventions in the cloud services market to those that use in-market mechanisms. Many of the challenges identified by the Working Paper are already being tackled by industry. Azure Arc and Microsoft Fabric are examples of enabling multi- and hybrid cloud better and more efficiently. Entities like CNCF are driving industry consensus on solutions that help address key customer pain points. Microsoft is fully supportive of these efforts and fully supportive of the CMA trying to support these organisations as well. Outcomes are likely to be much better if these existing processes are supported as opposed to new (national) government mandated decrees on the "right" standard or how multi-cloud "should" work in an international market.
- (58) Indeed, the unintended consequences of remedies are particularly relevant to complex, fastevolving and technical markets, such as cloud services, where even if a regulator had the expertise, it would lack the prescience to be confident that its interventions would not inadvertently make things worse. It gives rise to the spectre of international regulatory misalignment, with different regulators reaching different conclusions and choosing to impose different standards. The more intrusive proposals (standardisation, mandatory abstraction, connectivity) significantly disrupt investment incentives on the part of CSPs, and the path of technological innovation in cloud services in future.
- (59) Concretely, this rules out the imposition by the CMA of mandatory, detailed technical standards. In its place, the CMA should re-evaluate the role the open-source community, and in particular the CNCF, might be able to play in promoting new and existing mitigation of the concerns it has identified. In particular, the CMA could consider the extent to which CSP participation in the governance or funding of the CNCF is mandatory, as well as the uptake of the projects it incubates reaching a certain threshold. Such a proposal would safeguard the ability of market participants to rally around a solutions of their own choosing, rather than the risks attached to one imposed by a regulator.
- (60) Similarly, the operation and future of abstraction layers could be promoted and supported. While it makes little sense to require one cloud to create an abstraction layer it thinks might work well on every other cloud, support for efforts like Terraform could be positive.
- (61) Finally, CSPs could be required to continue to develop guidance on how to migrate key workloads to their cloud and provide more detail to the extent there are specific pain points or challenges identified that would benefit significantly from additional documentation. Microsoft is willing to discuss the scope of this requirement, as it would need to be common across all CSPs in order to be effective and properly scoped and defined to be workable. There is already a vibrant ecosystem of solutions providers who help customers with migrations and deployment design. To the extent specific information is helpful to these thriving businesses, CSPs could also support their efforts and ensure they have equivalent access to interoperability information as that made available to customers themselves. Importantly, this guidance would necessarily only cover the steps to migrate *to* that CSP, rather than the steps to migrate *from* a particular rival CSP. This important distinction avoids the documentation becoming an impossible burden on CSPs to keep up with individual developments in other CSPs' services.

(62) These three initiatives would go a significant distance to resolving any concerns that the CMA might conclude amount to an AEC, especially once the CMA accounts for the correct counterfactual that, in Microsoft's view, will ultimately demonstrate the current prevalence of switching and multi-cloud is not an indicator of a lack of competition.

4.2 Proposed remedies risk creating lowest common denominator, and stymie innovation for the UK in a dynamic global market

Increase standardisation through mandatory or voluntary standards administered by an independent body, or principle-based requirements, in order to increase interoperability and portability of cloud services.

- (63) In considering the level at which to impose standards, the CMA in general recognises that such standards might be better suited to services less abstracted from infrastructure, and therefore in particular focuses on standards for storage (*e.g.*, S3) and orchestration (*e.g.*, Kubernetes). As a proprietary standard belonging to AWS, there is a significant market-tipping risk attached to an intervention forcing 100% adoption of S3: this would grant AWS an even greater incumbency advantage than it already has, and undue influence over its rivals.
- (64) Moreover, this proposal traps the CMA in a continuous loop of picking a particular moment in a technology's development at which to standardise. This carries a significant risk of killing off any further innovation by introducing uncertainty as the market awaits consensus.
- (65) Any such remedy would in principle have to apply to all market participants, as otherwise the benefit is lost: it would only facilitate switching and multi-cloud between a limited subset of options, risking an *increase* in barriers to switching and multi-cloud from CSPs outside the scope of the remedy.
- (66) Microsoft has considerable concerns that this proposal will lead to the adoption of competing standards, or worse the wrong standards that are not led by technology innovation and customer needs, and have the unintended effect of slowing or eliminating innovation. At a minimum, innovation in the UK will slow as CSPs likely respond by carving out the UK market from innovations made available elsewhere.
- (67) A principles-based approach may be even worse and requires an arbiter to determine whether market participants have adhered to the principles, who in turn have to interpret these principles in day-to-day and strategic business decisions. This introduces significant uncertainty, and therefore also functions as a brake on innovation. It is unclear who that arbiter will be and whether it will have the long-term resources and funding to maintain such a role.
- (68) As described in section 3.1 above, the CMA does not credit the extent to which the open-source community has *already* provoked, addressed and is addressing many of the challenges identified in the working paper and how competition spurs on CSPs to support this: *e.g.*, Kubernetes, Parquet; or the role that the CNCF plays as a *de facto* industry-and-customer-led body in promoting open standards. This presents a missed opportunity for taking advantage of a body that already assists in improving interoperability.
- (69) Nonetheless, Microsoft does not dismiss out of hand the possibility of industry-led improvement. In that spirit, Microsoft considers additional approaches below.

Mandatory abstraction layers free of charge to allow customers to centrally manage and use IaaS services on multiple clouds through a single interface.

- (70) As implicitly recognised in the CMA's consultation questions relating to this proposal, existing solutions, from the CSPs themselves, the open-source community and from ISVs building abstraction layers across cloud platforms, perform this role already to a significant degree. Azure Arc offers an abstraction layer for the control plane, as does Terraform (open-source) for provisioning infrastructure in different clouds. As previously submitted, Google's Anthos is a response to Azure Arc, as well as AWS's EKS Anywhere offering.
- (71) The CMA recognises that these existing tools assist with interoperability and portability and are workable. Microsoft disagrees with the CMA's suggestion that their relatively low use means that they are, however, insufficient, but recognises Jigsaw's conclusion that they inherently add some complexity and customers will only use them if they see value.
- (72) It is therefore unclear to Microsoft how the proposed mandatory abstraction layers would differ. In particular, given that the Working Paper concludes that "such software does not fully overcome the challenges of using multiple public clouds and switching between them,"²⁵ it is also unclear to Microsoft how this proposal would lead to better outcomes than the abstraction layers currently available.
- (73) Fundamentally, the CMA does not currently explain, and should consider further, how the firstparty mandatory abstraction layers will be any different or avoid the same complexity. There is equally no explanation how a CSP is supposed to make sure the way its abstraction layer works means perfect porting to other clouds, because that depends on how the abstraction layer is built for each cloud and requires a continuing technical collaboration with every other CSP. This is why third parties build these layers and test them against supported clouds as to do it well typically involves cross-cloud development.
- (74) In fact, many abstraction layers already exist and are supported across clouds. Customers are not required to use them and choose not to if they do not find value. Indeed, the choice to use an abstraction layer necessarily involves (i) assuming some of the responsibilities that might otherwise have been delegated to the CSP, and (ii) create a new dependency to the abstraction layer. That will not change if the CMA forces all cloud providers to build their own abstraction layer.
- (75) The CMA does not explain why ISVs (using the public APIs exposed by CSPs) are not an appropriate substitute for the first-party abstraction layers it proposes CSPs develop, especially once it is taken into account that low-spend cloud customers are unlikely to adopt multi-cloud and therefore cost is less of a constraint.

Increased connectivity to reduce latency through mandatory direct fibre lines between geographically proximate CSP datacentres, or by requiring CSPs to make data centre space available for rival CSPs on FRAND terms.

(76) The CMA recognises the potential disincentive for future investment in UK data centres as a result of such a proposed remedy. Navigating permitting and planning requirements for UK data centres is already a lengthy and complicated process. This would add another obstacle that is faced by CSPs in neighbouring countries, such as Ireland and the Netherlands. impose none of these requirements. Such datacentres are sufficiently close to the UK to offer acceptable latency to all but the most sensitive of applications and are therefore viable alternatives for most customers.

²⁵ Working Paper, paragraph 1.13.

- (77) Moreover, such a proposal carries significant security and management risks, as it would involve the comingling of each CSP's secured environment. By virtue of its visit to a Microsoft Azure data centre, the CMA is personally aware of the intense levels of security entailed in data centre operation. In Microsoft's limited experience of colocation with another CSP, it has been difficult to arrive at a commercial agreement that adequately caters for and reflects the shared responsibilities and risks.
- (78) Above all, direct interconnects between CSP datacentres already $exist^{26}$ and do not resolve the latency problem for latency-sensitive applications. To give context, the typical latency for an intra-datacentre transaction is between 100 and 1000 μ s. An inter-zone transaction, such as through a direct interconnect, is typically in the region of 1 to 10 ms, *i.e.*, between 10 and 100 times slower. This is nonetheless faster than a public internet transaction between two adjacent regions, which is typically in the region of 10 to 100 ms, *i.e.*, between 100 and 1,000 times slower. For further illustration, the latencies between Azure datacentres within Microsoft's own network are around 7-8 ms between the UK South and the UK West regions.²⁷ Latency-sensitive applications differ in terms of tolerance, but typically require less than 200 μ s, *i.e.*, the lower range of an intra-datacentre transaction given above. The speed of light is, in fact, a limitation that cannot be regulated around.



Figure 1 Typical latency ranges

Source: ByteByteGo, <u>https://www.youtube.com/watch?v=FqR5vESuKe0</u>

Increase transparency on interoperability through increased dedicated documentation on interoperability and how to migrate away to rival services, as well as giving a mandatory 30-day notice prior to rolling out "material updates" to a cloud service (with an exemption for security-related emergency updates).

(79) The consultation questions reveal the CMA is uncertain about what might constitute a "major update". In particular, the CMA has not identified any problems with the existing process by which CSPs notify and update cloud services. A 30-day advance notice requirement would be

²⁶ E.g., <u>Lumen - Lumen, Google and Microsoft create new on-demand, optical interconnection ecosystem</u>

²⁷ <u>https://learn.microsoft.com/en-us/azure/networking/azure-network-latency?tabs=Europe%2CUKNorthEurope</u>

unworkable given that, for example, thousands of updates are applied within the Microsoft Azure footprint daily, with material updates already reported on a weekly basis.²⁸

- (80) Such obligations would limit the flexibility and agility of CSPs in the UK, ultimately degrading customer experiences and place cloud services deployed in UK datacentres on a slower and unique update cycle relative to their international counterparts. As noted in paragraph (76) above, it is entirely conceivable for a customer to move to a nearby non-UK datacentre as a result.
- (81) The CMA does not explain in what specific regards Microsoft's existing and extensive documentation is insufficient. It would be particularly burdensome for each CSP to provide documentation on interoperability with other CSPs' services, as that requires a working, continuously-up-to-date knowledge of each permutation across numerous different clouds. Moreover, given the volume of updates mentioned above, even a small update can subtly change the facts that need to be reflected in the documentation.

Increase portability of skills between CSP solutions by requiring CSPs to include a minimum amount of "cloud-agnostic" content in their training resources.

- (82) There is no shortage of available training materials and opportunities, enabling motivated developers to easily learn about and enhance their skills to build on GCP, Azure, and AWS. All three major CSPs have invested heavily in developing and offering training for developers.
- (83) For example, on the LinkedIn Learning platform alone there are over 3,000 courses on Google Cloud Platform, over 7,600 on Microsoft Azure, and over 7,400 on Amazon Web Services. On YouTube, the Google Cloud Tech channel²⁹ has over 4,800 videos, the Microsoft Azure channel³⁰ has over 1,300 videos, and the Amazon Web Services channel³¹ has over 16,000 videos.
- (84) All three cloud providers host multi-day developer conferences annually, boasting hundreds of learning sessions in person and on-demand (*e.g.*, <u>Google Cloud Next</u>, <u>Amazon re:invent</u>, <u>Microsoft Build</u>). All three cloud providers offer certification programmes for engineers and developers to improve and demonstrate their knowledge and skills. Microsoft offers a free training website specifically to develop Azure skills.³²
- (85) Developers also learn and share technical knowledge with one another on collaboration platforms and online communities like <u>Stack Overflow</u> (reporting 100+ million monthly users), GitHub, and Reddit.
- (86) To the extent there are gaps, an entire segment of consultants, including firms such as Accenture and EY, has emerged to provide support for developers.
- (87) The CMA's consultation questions reveal it is uncertain as to the meaning of "cloud-agnostic" content. To the extent such content concerns Kubernetes, the Cloud Native Cloud Foundation offers extensive <u>documentation</u>, <u>training and certification programs</u> for developers.

²⁸ See <u>Azure Updates - Microsoft Community Hub</u>

²⁹ <u>Google Cloud Tech - YouTube</u>

³⁰ <u>Microsoft Azure - YouTube</u>

^{31 &}lt;u>Amazon Web Services - YouTube</u>

³² <u>https://learn.microsoft.com/en-us/training/azure/</u>

(88) As the prevalence of multi-cloud increases, so will the reward for those engineers familiar with more than one cloud, leading to a market-initiated incentive to obtain this skillset.

* * *

ANNEX

THIRD-PARTY SURVEY EVIDENCE OF MULTI-CLOUD PREVALENCE

1. SUMMARY

- (1) The CMA dismisses evidence from quantitative surveys in the public cloud market³³ due to lack of validity, lacking quality and coverage of respondents. However, cloud providers rely on such industry reports to inform their product and business strategy, so it seems unreasonable for the CMA to find methodological faults with each single one and dismiss them.³⁴
- (2) Although the methodology and method of data collection (online or phone or in-person or a mix) vary by survey, these industry reports (or a combination of them) are used by cloud providers in the ordinary course of business to ascertain customer cloud spending trends and inform their senior-level decision-making. Therefore, these various industry reports are widely accepted as being informative of the sector and should be considered, at least cumulatively across all the reports, by the CMA as important evidence of the prevalence of multi-cloud.
- (3) Summarised below is the most recent (2023/2024) evidence on multi-cloud from widely recognised public surveys in the cloud sector as well as Ofcom's research survey,³⁵ alongside a description of the methodology used in the different reports. The evidence from the different reports should be triangulated and interpreted in the round.

1.1 'Flexera 2024 State of the Cloud Report', Flexera, 2024^{36, 37}

- (4) The 2024 Flexera survey interviewed 753 "technical professionals and executive leaders" from around the world in the winter of 2023.³⁸ The survey covered SMBs (small and Medium Businesses with fewer than 1,000 employees), Enterprises (organisations with more than 1,000 employees) and Large Enterprises (organisations with more than 10,000 employees).³⁹ The survey covered various sectors (tech, financial, health, etc) and geographies, with two-thirds of the respondents coming from the Americas, 9% from the UK, and others from the rest of the world.⁴⁰
- (5) **The report found that 89% of all survey respondents reported having a multi-cloud strategy** (an increase from the 87% reported in the 2023 report).^{41,42} Moreover, the report also

³³ Competitive Landscape Working Paper, paragraphs 3.59 – 3.61.

³⁴ For example, Microsoft has invested in and offers tools to manage multi-cloud architectures – please see 'Hybrid and multi-cloud solutions', Microsoft, 2024, available here: <u>Multi-cloud and Hybrid Cloud Solutions | Microsoft</u> <u>Azure</u>

³⁵ 'Cloud Services Market Research', Context Consulting and Ofcom, March 2023, available here: <u>Cloud Services</u> <u>Market Research - Summary of Findings March 2023 (ofcom.org.uk)</u>

³⁶ Flexera, 'Flexera 2024 State of the Cloud Report', 2024, available here: <u>2024 State of the Cloud Report | Flexera</u>

³⁷ CMA references the 2023 iteration of the report in the Competitive Landscape Working Paper, Appendix A.

³⁸ Flexera, 'Flexera 2024 State of the Cloud Report', p. 8, 2024, available here: <u>2024 State of the Cloud Report</u>] <u>Flexera</u>

³⁹ Flexera, 'Flexera 2024 State of the Cloud Report', p. 8, 2024, available here: <u>2024 State of the Cloud Report |</u> <u>Flexera</u>

⁴⁰ Flexera, 'Flexera 2024 State of the Cloud Report', pp. 10-11, 2024, available here: <u>2024 State of the Cloud Report</u> |<u>Flexera</u>

⁴¹ Further, in the Flexera report, multi-cloud is defined as using at least two clouds, regardless of whether the clouds are public or private.

⁴² Flexera, 'Flexera 2024 State of the Cloud Report', p. 16, 2024, available here: <u>2024 State of the Cloud Report</u> | <u>Flexera</u>

points out that 73% of all respondents use multiple public clouds (14% use only multiple public clouds while 59% use multiple public clouds along with some form of private cloud), up from 69% in the previous year (13% using only multiple public clouds and 56% use multiple public clouds along with some form of private cloud).^{43,44} Additionally, it should be noted that data integration between clouds (integrated multi-cloud) increased to 45% from 37% year on year.⁴⁵

1.2 'Multicloud in the mainstream', S&P Global Market Intelligence (commissioned by Oracle), February 2023⁴⁶

- (6) The survey data was collected by 451 Research, an arm of S&P Global Market Intelligence. The survey was commissioned by Oracle. The survey was fielded in Q3 2022, and the respondents were from a cross-industry sample of 1,500 "enterprise"⁴⁷ respondents from North America, Europe, Asia-Pacific, the Middle East, and Latin America.⁴⁸
- (7) According to the report, 98% of the respondents were using/looking to use more than one cloud provider.⁴⁹ This is in line with a March 2023 Ofcom report in which 86% of all surveyed companies currently using only one provider stated that they are considering a move to multi-cloud.⁵⁰
- (8) The Oracle report additionally suggests that the COVID-19 pandemic has been a "significant driver" of multi-cloud use, with 91% of survey respondents at least somewhat agreeing with this proposition.⁵¹
- (9) The three biggest challenges to multi-cloud cited in the Oracle paper (cloud provider management, networking/interconnectivity and data governance issues)⁵² almost perfectly align with the issues cited by Ofcom.⁵³

⁴³ Flexera, 'Flexera 2024 State of the Cloud Report', p. 16-17, 2024, available here: <u>2024 State of the Cloud Report |</u> <u>Flexera</u>

⁴⁴ Flexera, 'Flexera 2023 State of the Cloud Report', p. 18-19, 2023, available here: <u>Cloud computing Stats: Flexera</u> <u>2023 State of the Cloud Report</u>

⁴⁵ Flexera, 'Flexera 2024 State of the Cloud Report', p. 18, 2024, available here: <u>2024 State of the Cloud Report</u> | <u>Flexera</u>

⁴⁶ Posey M, 'Multicloud in the mainstream', S&P Global Market Intelligence (commissioned by Oracle), February 2023, available here: <u>S&P Global Discovery Report: Multicloud in the mainstream (oracle.com)</u>

⁴⁷ An "enterprise" is defined as an organisation with more than 1,000 full-time employees for respondents in North America, and more than 500 full-time employees for respondents in all other regions.

⁴⁸ Posey M, 'Multicloud in the mainstream', p. 15, S&P Global Market Intelligence (commissioned by Oracle), February 2023, available here: <u>S&P Global Discovery Report: Multicloud in the mainstream (oracle.com)</u>

 ⁴⁹ Posey M, 'Multicloud in the mainstream', p. 1, S&P Global Market Intelligence (commissioned by Oracle),
February 2023, available here: <u>S&P Global Discovery Report: Multicloud in the mainstream (oracle.com)</u>

⁵⁰ Context Consulting and Ofcom, 'Cloud Services Market Research', p. 77, March 2023, available here: <u>Cloud</u> <u>Services Market Research - Summary of Findings March 2023 (ofcom.org.uk)</u>

⁵¹ Posey M, 'Multicloud in the mainstream', p. 3, S&P Global Market Intelligence (commissioned by Oracle), February 2023, available here: <u>S&P Global Discovery Report: Multicloud in the mainstream (oracle.com)</u>

⁵² Posey M, 'Multicloud in the mainstream', p. 7, S&P Global Market Intelligence (commissioned by Oracle), February 2023, available here: <u>S&P Global Discovery Report: Multicloud in the mainstream (oracle.com)</u>

⁵³ Context Consulting and Ofcom, 'Cloud Services Market Research', p. 80, March 2023, available here: <u>Cloud</u> <u>Services Market Research - Summary of Findings March 2023 (ofcom.org.uk)</u>

1.3 Public First Poll for CCIA (Cloud Users)', Public First, June 2023⁵⁴

- (10) The data was collected from an online survey of "UK senior business decision makers" conducted from the 25th of May to the 1st of June 2023; the sample size was 1,001 such decision makers.⁵⁵
- (11) According to the Public First survey, 71% of all IaaS or PaaS-using respondents used more than one cloud provider.⁵⁶ Moreover, 56% of this IaaS or PaaS user base stated that it is likely that in the next few years, they would add an additional cloud infrastructure provider.⁵⁷ This percentage increases to 66% when looking at the base of existing multi-cloud customers.⁵⁸

1.4 'Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and Cybersecurity Are Top Demand Drivers', IDC Market Perspective, March 2024⁵⁹

- (12) IDC's Future Enterprise Resiliency and Spending Survey, Wave 11, December 2023, looked at 881 enterprise buyers' multi-cloud use cases.⁶⁰
- (13) According to the report, 55% of respondents already applied multi-cloud, while c. 34% were looking to deploy multi-cloud in 2024 (the survey was taken in December 2023).⁶¹

⁵⁴ Public First, 'Public First Poll for CCIA (Cloud Users)', June 2023, available here: <u>CCIA Survey.xlsx (live.com)</u>

⁵⁵ Public First, 'Public First Poll for CCIA (Cloud Users)', 'Cover Sheet', June 2023, available here: <u>CCIA_Survey.xlsx (live.com)</u>

⁵⁶ Public First, 'Public First Poll for CCIA (Cloud Users)', 'Table 19', June 2023, available here: <u>CCIA_Survey.xlsx</u> (<u>live.com</u>)

⁵⁷ Public First, 'Public First Poll for CCIA (Cloud Users)', 'Table 56', June 2023, available here: <u>CCIA_Survey.xlsx</u> (<u>live.com</u>)

⁵⁸ Public First, 'Public First Poll for CCIA (Cloud Users)', 'Table 71, June 2023, available here: <u>CCIA_Survey.xlsx</u> (<u>live.com</u>)

⁵⁹ Bhagavath V and Mehra R, 'Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and Cybersecurity Are Top Demand Drivers', IDC Market Perspective, March 2024, available here: <u>Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and Cybersecurity Are Top Demand Drivers (idc.com)</u>

⁶⁰ Bhagavath V and Mehra R, 'Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and Cybersecurity Are Top Demand Drivers', p.3, IDC Market Perspective, March 2024, available here: <u>Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and</u> <u>Cybersecurity Are Top Demand Drivers (idc.com)</u>

⁶¹ Bhagavath V and Mehra R, 'Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and Cybersecurity Are Top Demand Drivers', p. 3, IDC Market Perspective, March 2024, available here: <u>Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and</u> <u>Cybersecurity Are Top Demand Drivers (idc.com)</u>

Figure 2 What are the enterprise buyers' multi-cloud networking deployment timelines?⁶²



1.5 'Hybrid, Multi-cloud Management Maturity', Enterprise Strategy Group (commissioned by Infoblox) April 2024⁶³

(14) The survey data was collected by Enterprise Strategy Group. The survey was commissioned by Infoblox.⁶⁴ The data was collected from an online survey of 1,000 "networking and security decision-makers and influencers knowledgeable about their organisation's public cloud environment".⁶⁵ These included public and private sector organisations from North America (US and Canada), Western Europe (France, Germany, Spain and the UK) and Asia-Pacific (Australia, India, Japan, New Zealand and Singapore).⁶⁶

⁶² Bhagavath V and Mehra R, 'Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and Cybersecurity Are Top Demand Drivers', p.3, IDC Market Perspective, March 2024, available here: <u>Multi-cloud Networking Will Inflect in 2024; Public and Private AI, Application Resiliency, and Cybersecurity Are Top Demand Drivers (idc.com)</u>

⁶³ DeMattia A and Grady J, 'Hybrid, Multi-cloud Management Maturity', Enterprise Strategy Group (commissioned by Infoblox), April 2024, available here: <u>Hybrid, Multi-Cloud Management Maturity Report - Infoblox</u>

⁶⁴ DeMattia A and Grady J, 'Hybrid, Multi-cloud Management Maturity', p.6, Enterprise Strategy Group (commissioned by Infoblox), April 2024, available here: <u>Hybrid, Multi-Cloud Management Maturity Report -</u> <u>Infoblox</u>

⁶⁵ DeMattia A and Grady J, 'Hybrid, Multi-cloud Management Maturity', p.21, Enterprise Strategy Group (commissioned by Infoblox), April 2024, available here: <u>Hybrid, Multi-Cloud Management Maturity Report -</u> <u>Infoblox</u>

⁶⁶ DeMattia A and Grady J, 'Hybrid, Multi-cloud Management Maturity', p. 21, Enterprise Strategy Group (commissioned by Infoblox), April 2024, available here: <u>Hybrid, Multi-Cloud Management Maturity Report -</u> <u>Infoblox</u>

- (15) The survey was fielded from the 15th of December 2023 to the 17th of January 2024, with the margin of error at the 95% confidence level for the sample being identified as ±3 percentage points.⁶⁷
- (16) The report cites that 96% of the subset of respondents who multi-cloud will look to work with at least as many IaaS providers in the next 12 months, while 68% expect to partner with *even more* cloud providers.⁶⁸

⁶⁷ DeMattia A and Grady J, 'Hybrid, Multi-cloud Management Maturity', p. 21, Enterprise Strategy Group (commissioned by Infoblox), April 2024, available here: <u>Hybrid, Multi-Cloud Management Maturity Report -</u><u>Infoblox</u>

⁶⁸ DeMattia A and Grady J, 'Hybrid, Multi-cloud Management Maturity', p. 6, Enterprise Strategy Group (commissioned by Infoblox), April 2024, available here: <u>Hybrid, Multi-Cloud Management Maturity Report -</u> <u>Infoblox</u>