Appendix Q: Analysis of cloud providers' cost of egress

Q.1 In this appendix we summarise the types of costs that cloud providers have identified as incurred in providing egress data transfer services and set out our analysis of the cost-reflectivity of cloud providers' egress fees.

Cloud providers' submissions

Q.2 The following section sets out cloud providers' submissions on the costs incurred in providing egress data transfer services, including costs that are egress-specific and/or incremental. It also sets out cloud providers' views on cost recovery and the cost-reflectivity of egress fees.

Costs that cloud providers incur in providing data transfer services

Q.3 Cloud providers identified a range of costs that are incurred in providing data transfers for customers. The costs identified can broadly be summarised as:

(a) costs related to having network infrastructure, eg costs to build or lease data centres and other fixed infrastructure;

(b) costs of connectivity to the internet, or to other clouds, third parties or direct customer connections; and

(c) shared business/overhead costs, eg sales & marketing, HR, legal.

Infrastructure costs

Q.4 Network infrastructure costs can vary substantially between providers depending on the extent to which they invest in building their own backbone network or rely on transit (provided by Internet Service Providers (ISPs) or Network Service Providers (NSPs)) to transfer data over the public internet. We set out the key network assets used by cloud providers in transferring data in Appendix L.

Q.5 However, generally providers will have some data centre presence which incurs associated costs. Cloud providers cite fixed and variable data centre costs (utilities, wages, rent etc) and costs for network equipment (depreciation and maintenance costs) as data transfer costs.[1]

Connectivity costs

Q.6 Connectivity costs are incurred to connect network locations within a cloud and to external parties and to transfer data out of a cloud. This can include costs to

[1] Responses to the CMA's information requests [✂]; [✂] response to Ofcom's information request [✂].

connect networks to edge points of presence (POPs) such as metro (short-haul) cable costs; transit/bandwidth costs (for transfers over internet); and port charges for physical interconnections of the network to third party paid or free transit/peering.[2]

Q.7 Cloud providers said they incur different costs based on location/peering provider for transfers and routing.[3] Cloud providers identified the following types of arrangements with ISPs:[4]

(a) Settlement-free peering: Both parties exchange traffic freely between their networks with no traffic-associated fees.

(b) Paid peering: Cloud provider pays the ISP peering partner a price per mbps based on the amount of traffic exchanged between the networks. That traffic could terminate into the customers of that ISP network.

(c) IP Transit: Cloud provider pays the transit provider a price per mbps based on the amount of traffic exchanged between the networks. That traffic could terminate anywhere in the world.

(d) Internet exchange (IX) ports: Cloud provider and peering partner will exchange traffic through IX ports and the cloud provider and peering partner will pay the IX provider's port fee.

Q.8 One cloud provider said that for private network interconnections for third party paid or free transit/peering, the physical interconnection which enables the data exchange may incur a small ongoing port charge in some instances (in the range of £150-£300 per month in the UK). The cloud provider said it bears this cost and it becomes significantly more expensive at scale.[5]

Q.9 One cloud provider said most of its internet peering is settlement free.[6] Another cloud provider said internet peering arrangements with ISPs are mostly on a settlement-free basis.[7] Cloudflare, a Content Delivery Network (CDN) that competes with cloud providers in offering data transfers to end users, has an open peering policy and peers with more than 12,000 networks around the world on a settlement-free basis.[8]

Q.10 In the UK, AWS, Microsoft, Google, Oracle and IBM all have some settlement-free peering.

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[2] Peering is the exchange of traffic between networks. Peering uses direct connections between networks to send traffic to these networks.
[3] Responses to the CMA's information requests [✂]; [✂] response to Ofcom's information request [✂].
[4] Responses to the CMA's information requests [✂].
[5] [✂] response to the CMA's information request [✂].
[6] [✂] response to the CMA's information request [✂].
[7] [✂] response to the CMA's information request [✂].
[8] The Cloudflare Blog, accessed 10 September 2024.

(a) Of AWS' [✂].[9]

(b) Microsoft has [✂] direct connections in the UK, to [✂]. All of these peering connections in the UK are settlement-free.[10] Microsoft said it does not pay any fixed or variable costs to ISPs in the UK.[11]

(c) Google has approximately [✂] peering connections in the UK. Of these, [✂] are to settlement-free peering exchanges and [✂] are direct settlement-free connections.[12]

(d) Of Oracle's [✂] connections are settlement free.[13]

(e) IBM [✂].[14]

Q.11 There are some settlement-free connections between [✂] in the UK.[15] Google also has settlement-free connections with [✂] in the UK.[16] Microsoft's interconnection arrangement with Oracle means that costs such as cross connect, access fees and internet exchange port fees are not applicable to this service.[17] It is unclear whether IBM has settlement-free connections with cloud providers in the UK.[18]

Shared business/overhead costs

Q.12 Some cloud providers cited shared and/or overhead business costs such as sales and marketing, customer service, HR, IT and/or R&D as costs of providing data transfer.[19] However, other cloud providers did not cite general business costs such as sales and marketing as costs of data transfer in their responses.

Common data transfer costs vs egress-specific costs

Q.13 Cloud providers all submitted that generally the same fixed assets are or may be used to ingress and egress customer data.[20]

Q.14 Cloud providers expressed somewhat varying views on what were common vs specific costs for egress compared to internal data transfers. When asked what costs were specific to egress, ingress or internal data transfers:

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[9] AWS's response to the CMA's information request [✂].
[10] Microsoft's response to the CMA's information request [✂].
[11] Microsoft's response to the CMA's information request [✂].
[12] [✂]. Google's response to the CMA's information request [✂].
[13] Oracle's response to the CMA's information request [✂].
[14] IBM's response to the CMA's information request [✂].
[15] Responses to the CMA's information requests [✂].
[16] Google's response to the CMA's information request [✂].
[17] Microsoft's response to the CMA's information request [✂].
[18] IBM's response to the CMA's information request [✂].
[19] Responses to the CMA's information requests [✂].
[20] Responses to the CMA's information requests [✂].

(a) AWS submitted that, of the [✂] costs it allocates to egress, [✂] are also relevant to internal transfers within the AWS network.[21]

(b) Microsoft said that for egress it incurs incremental interconnection costs for data transfers over the public internet.[22] Microsoft cites the following as costs specific to connecting to another cloud provider or any other ISP network (not as specific to egress): cost of relevant hardware, access infrastructure, cross connects, internet exchange port fees.[23]

(c) Google identified edge networking infrastructure (eg leased space and power at colocation data centres and points of presence, paid-peering) and the dedicated physical connection installed between Google and the destination infrastructure for Google Interconnect products as being specific to external data transfers.[24]

(d) IBM identified data centre interconnectivity costs as specific to internal data transfers and the costs of public internet connectivity from each data centre as specific to egress.[25]

(e) Oracle said it does not typically incur separate costs for ingress, egress, or transferring customer data, but also said is uses both 'core' and edge assets for external data transfers (ingress and egress) whereas internal data transfers only use 'core' assets.[26]

(f) OVHcloud submitted that the only technical justification for egress fees is the cost for using internet bandwidth from ISPs or from other operators, such as suppliers of connectivity solutions.[27]

Q.15 AWS submitted that although internal data transfers and egress make use of the same data centre and network assets, AWS apportions cost based on usage and its per-GB costs are higher for egress than internal data transfer.[28]

Q.16 Google submitted that certain types of data transfer are more expensive than others (eg because they rely on its expensive edge network). Google acknowledged that much of the same 'backbone' network infrastructure is used to support internal and external data transfers, but submitted that there are significant additional hardware components, infrastructure, software and other costs associated with the final 'external' leg of a data transfer. It said managing its

[21] AWS' responses to the CMA's information request [✂].
[22] Microsoft's responses to the CMA's information request [✂].
[23] Microsoft's responses to the CMA's information request [✂].
[24] Google 's responses to the CMA's information request [✂].
[25] IBM's responses to the CMA's information request [✂].
[26] Oracle's responses to the CMA's information requests [✂].
[27] OVHcloud's submission to the CMA [✂].
[28] AWS' response to the CMA's updated issues statement and working papers, 23 November 2023, paragraph 31.

presence in ‘carrier neutral facilities’ that are used for internet transit/ peering incurs incremental costs, such as [✂].[29]

Q.17 Oracle disagreed with OVHcloud’s position that ‘the only technical justification for egress fees is the cost for using internet bandwidth from ISPs or from other operators’. Oracle said this ‘misses market realities’, as a provider like OVHcloud – which may not have built its own global infrastructure – does not account for capital expenditures on physical cables and server racks that are appropriate to include in the estimated costs to a cloud provider.[30]

Q.18 One cloud provider noted that the same network supports inbound and outbound transfers at the same time, but that their capacity is built to support the requirements of the dominant direction of traffic (which for the cloud provider is outbound dominant) rather than the sum of both directions.[31] The cloud provider has said that, as at September 2023, over [✂] of its regions are outbound dominant (including [✂]) but it does not account for costs for inbound transfers in any regions.[32]

Incremental costs

Q.19 In relation to the incremental costs of providing egress data transfers to customers, cloud providers identified the following:

(a) Burst fees: Some cloud providers identified excess fees charged for bandwidth usage above committed capacity levels (also called ‘burst fees’) as incremental costs for providing egress. They said that if monthly data transfer rates exceed their minimum commitments, then an additional charge is calculated based on an incremental rate.[33] [✂] said that if monthly data transmission rates are within the committed limits, then zero incremental and variable costs are incurred related to data egress.[34]

(b) Microsoft identified the incremental cost of interconnection over the public internet for egress.[35] It did not specify what these incremental costs were.

(c) IBM identified hardware maintenance and energy consumption as incremental costs incurred when transferring data.[36]

[29] Google’s submission to the CMA [✂].
[30] Oracle's response to the Updated Issues Statement and working papers, 06 June 2024, page 2.
[31] [✂] response to the CMA’s information request [✂].
[32] [✂] response to the CMA’s information request [✂].
[33] Responses to the CMA’s information requests [✂].
[34] [✂] response to the CMA’s information request [✂].
[35] Microsoft’s response to the CMA’s information request [✂].
[36] IBM’s response to the CMA’s information request [✂].

(d) A cloud provider [✂] data centre operating expenses are only incrementally incurred when attributable to a specific product.[37]

(e) In contrast, one cloud provider said capital investment in infrastructure should be included as a cost of incremental added capacity and that it does not consider network and infrastructure costs as either fixed or variable costs, as many of these costs have both fixed and variable components.[38] The cloud provider noted that an incremental measure of one unit out of billions of egress gigabytes transferred every year would not be relevant from its business perspective. The cloud provider said it needs to make investment decisions and incur costs to grow the network in a way that can safely and reliably accommodate 'incremental' customer egress needs of several billions of gigabytes every year.[39]

(f) One cloud provider argued that inbound data transfers are a one-time cost that can be incorporated into the price for storing the data, whereas this is not the same for outbound data as some customers may not plan to transfer their data out or will transfer data millions of times daily.[40]

(g) One cloud provider said it was unable to estimate its incremental costs. It said it pays [✂] that includes a mix of fixed and incremental components.[41] However, the cloud provider provided information indicating that not all costs being recovered via egress fees are incrementally incurred per egress transfer or specific to egress.[42]

Q.20 OVHcloud submitted that some cloud providers have made private peering or private network interconnect (PNI) agreements to interconnect their services to reduce costs. OVHcloud said that by using private network to transfer data, they do not require the use of internet bandwidth.[43]

Q.21 A CDN provider submitted that the marginal costs of data transfer for AWS, Microsoft and Google are often near-zero for large customers, because they use third party CDNs who have interconnected infrastructure to these cloud providers.[44]

Cost recovery and extent to which egress fees are cost-reflective

Q.22 Cloud providers submitted that egress fees recover costs:

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[37] [✂] response to the CMA's information request [✂].
[38] [✂] response to the CMA's information request [✂].
[39] [✂] response to the CMA's information request [✂].
[40] [✂] submission to Ofcom [✂].
[41] [✂] response to the CMA's information request [✂].
[42] [✂] response to the CMA's information request [✂].
[43] OVHcloud's submission to the CMA [✂].
[44] Cloudflare submission to Ofcom in response to its Interim Report, 5 April 2023, page 2.

(a) AWS said that compensating cloud 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.[45]

(b) Microsoft said that an element of charging for data transfers is important for cost recovery.[46]

(c) Google said data transfer fees allow cloud providers to recover costs of network infrastructure usage but that it does not set prices for networking products exclusively with cost recovery in mind.[47]

(d) IBM said that if the costs incurred by a cloud provider are not recovered in one form, they will likely be recovered elsewhere, in order to allow the provider to achieve an economic return.[48]

(e) Oracle said that it takes a cost [✂].[49]

Q.23 On the extent to which egress fees are cost-reflective, cloud providers submitted the following:

(a) AWS submitted that the revenues from global egress fees and egress costs are closely related and cost-reflective.[50] AWS submitted that its egress fees reflect the significant investment that AWS has made to build an extremely fast, secure and resilient global network for AWS' customers to transfer data.[51]

(b) AWS submitted that it prices according to costs and that for external transfers, these encompass far more than the internet transit and peering costs suggested by the CMA's Egress fees working paper.[52]

(c) Microsoft also submitted that banning or setting egress fees artificially low through regulation would distort prices such that they are not reflective of the true underlying costs and value provided and would break the existing cloud model of customers paying for actual services consumed.[53]

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[45] AWS response to the Issues Statement, dated 23 November 2023, page 14.
[46] Microsoft's response to the Issues Statement, dated 09 November 2023, page 9.
[47] Google's response to the Issues Statement, dated 17 October 2023, page 7; Google's response to the Egress fees working paper, 23 June 2024, paragraph 22.
[48] IBM response to the Issues Statement, dated 09 November 2023, page 3.
[49] Oracle's response to the CMA's information request [✂].
[50] AWS' response to the CMA's Egress fees working paper dated 23 May 2024, paragraph 12.
[51] AWS' response to the CMA's Egress fees working paper dated 23 May 2024, paragraph 2.
[52] AWS' response to the CMA's updated issues statement and working papers, paragraph 31.
[53] Microsoft's response to the Competitive Landscape, Committed Spend Agreements and Egress Fees working papers, paragraph 95.

(d) Google submitted that its networking prices reflect the quality and innovation of its networking products, as well as its cost and ongoing investment.[54]

(e) Google submitted that certain types of data transfer are more expensive than others (e because they rely on its expensive edge network).[55] Google submitted that it makes commercial sense for its charges for external transfers to take into account the costs and investments associated with the edge network and for its charges for internal transfers not to do so and that internal data transfers are generally less costly.[56]

(f) Oracle submitted that the fixed rate of 'egress fees' is a calculated assessment of how much it costs in terms of capital investment, intermediary charges (ie to an ISP or other network provider), plus the amount of profit a cloud provider seeks to make on the transaction added on top.[57]

(g) Oracle submitted that if egress fees for all cloud providers were based on a cost-recovery model, the costs of egress fees should be variable based on cloud providers' actual underlying costs and that instead, excessive egress fees are used by some cloud providers as an easy way to extract unreasonable profit margin while also serving as a gating factor, helping to lock in their customers.[58]

Q.24 Oracle submitted the example of data transfers between cloud providers via peering, which incur lower costs but the same egress fees are charged to customers. Oracle submitted that cost savings are not passed on to the customer in reflecting the lower cost of data transfer and said this suggests that other cloud providers' business decision to charge a much higher egress fee is based on a blended price estimate that includes a significantly greater profit margin variable.[59]

Q.25 On profit margins relating to egress fees:

(a) AWS submitted that [✂].[60]

(b) Google submitted that its networking prices [✂] products.[61]

(c) Oracle submitted that egress fees represent 'a classic example of extractive profits' and that the egress fees charged by AWS, Microsoft and Google do not correspond to costs incurred.[62]

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[54] Google's response to Egress Fees working Paper, 23 June 2024, paragraph 3(c).
[55] Google's response to Egress Fees working Paper, 23 June 2024, paragraph 24.
[56] Google's response to Egress Fees working Paper, 23 June 2024, paragraph 25.
[57] Oracle's response to the Updated Issues Statement, dated 6 June 2024, page 1.
[58] Oracle's response to the Updated Issues Statement, dated 6 June 2024, page 2.
[59] Oracle's response to the Updated Issues Statement, dated 6 June 2024, pages 1-2.
[60] AWS' submission to the CMA [✂].
[61] Google's submission to the CMA [✂].
[62] Oracle's response to the Updated Issues Statement, dated 6 June 2024, page 1.

Q.26 [✂]. Google submitted that differences in prices, cost and margins between cloud providers are likely to be reflective of different customer bases and preferences and/or different quality of product offerings, as well as different business models deployed by different cloud providers.[63]

Analysis of relevant costs for providing egress

Q.27 This section sets out our analysis of the costs cloud providers incur in providing egress data transfers to understand what costs may need to be recovered through egress fees, as some cloud providers have submitted that egress fees recover costs. We consider in particular:

(a) what costs are specifically relevant to egress data transfers; and

(b) the extent to which these apply incrementally per instance of egress for switching or multi-cloud.

Q.28 Given the different pricing applied to egress, ingress and internal data transfers by cloud providers such as AWS, Microsoft, Google, IBM and Oracle, we would expect this to reflect differences in the type and/or nature of costs that apply to these data transfer services, if pricing is related to cost recovery.

Costs specifically relevant to egress data transfers

Q.29 As set out in Appendix L, cloud providers generally do not charge for data ingress, but most cloud providers charge customers for egress. The three main cloud providers also typically charge a much higher rate for egress data transfers compared to internal (within cloud) data transfers.[64] Given this, we have considered the extent to which there are costs which are specific to egress which may explain the difference in egress pricing relative to ingress and internal data transfer pricing.

Q.30 Given cloud providers' use of shared assets for providing data transfer services, it appears that the capex incurred for network fixed assets and any ongoing annual expenses associated with these assets (eg depreciation, maintenance) are common to both the ingress and egress of data and to a large extent internal data transfers and hence the recovery of this fixed cost expenditure is applicable to provision of ingress, egress and internal data transfer services.

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[63] Google's submission to the CMA [✂].
[64] See for example: EC2 On-Demand Instance Pricing – Amazon Web Services prices for data transfer out to the internet compared to data transfer within the same AWS region and to other AWS regions; Pricing - Cloud Storage - Google Cloud prices for general network usage (eg data transfers to the internet) compared with data transfer within the same Google region; Pricing - Bandwidth - Microsoft Azure prices for internet egress compared to data transfers between Availability Zones or within the same Availability Zone. Webpages accessed on 4 October 2024.

Q.31 Whilst egress may be a larger driver than ingress for additional network investment for some cloud providers, it appears that any investment will be used by both ingress and egress services and we view enabling ingress to be an essential function for cloud providers to be able to provide other cloud services such as data storage. As noted above, cloud providers generally provide ingress data transfers for free, which does not appear to be purely reflective of a difference in costs between providing ingress and egress, given cloud providers have identified shared costs for egress and ingress (ie ingress is not considered to be nil cost to provide).

Q.32 Based on cloud providers' submissions, the costs of connectivity to the public internet, in particular internet transit (ie bandwidth) and peering costs, appear to be the commonly cited egress-specific cost across a number of cloud providers.

Q.33 Google identified edge networking assets and dedicated physical connection assets for its Google Interconnect products as incurring costs specific to egress also.[65] However, based on other cloud providers' submissions edge networking assets appear to also be relevant to ingress data services and likely more relevant to CDN egress than switching and multi-cloud egress. Egress via individual customer direct connection/interconnection is also a distinct service from the internet egress for switching and multi-cloud that our assessment is focused on.

Q.34 We have noted that AWS and Google have submitted that internal data transfers are less costly than egress.[66] If both egress and internal data transfer fees charged by cloud providers are based on cost recovery, then the difference between egress and internal data transfer fees would be expected to reflect these identified egress-specific costs, which we consider in our cost-reflectivity analysis below. We also have noted that AWS and Google have not specified whether this applies to all egress, in particular the cross-cloud egress that is relevant for switching and multi-cloud use.

Q.35 In respect of one cloud provider's submission that its capacity is built to support the dominant direction of traffic,[67] we did not consider this to mean that investments in capacity are egress-specific. Capacity is needed to provide both ingress and egress data transfer services to customers and the associated costs are therefore relevant to both. For the same reason, costs for shared assets such as data centres are commonly allocated across services by cloud providers, not to a single 'dominant' cloud service such as compute.

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[65] Google's response to the CMA's information request [✂].
[66] AWS' response to the CMA's updated issues statement and working papers, 25 June 2024, paragraph 31; Google's response to Egress Fees Working Paper, 14 June 2024, paragraph 25.
[67] [✂] response to the CMA's information request [✂].

Extent to which identified costs are incrementally incurred

Q.36 As egress data transfers are charged based on volumes (ie at a $ per GB rate) we were also interested in the extent to which the costs for providing egress are incurred incrementally, to understand the extent to which volume-based pricing may reflect incrementally incurred cost recovery.

Q.37 For fixed costs or additional investment (eg in network expansion) specifically for data transfer services, cloud providers may have some degree of control over the timing of those costs and how quickly costs are recovered through fees, which may also mean that they are less directly attributable per instance of egress and less comparable between cloud providers. Additionally, for infrastructure investment and business costs that may support the provision of multiple cloud services (eg data centres, HR costs), the extent to which costs are recovered through data transfer services or through other cloud services will be subject to cloud providers' business strategy and pricing decisions.

Q.38 Cloud providers have provided us with limited detail on their incremental costs of transferring or egressing customer data. They also expressed differing views on what should be considered incremental costs of egress.

Q.39 Based on the descriptions of costs provided and set out in the previous section (paragraphs Q.3 to Q.21), bandwidth excess fees (or 'burst fees') may be the only type of cost that can be incremental per individual data egress instance (when a cloud providers' data traffic has exceeded monthly fixed bandwidth levels). For some of the costs identified, eg hardware maintenance and energy consumption, it is not clear that these are incurred per instance of egress, but instead appear more likely to be variable or semi-variable costs based on general level of activity.

Q.40 We have noted that some arrangements (paid peering and IP transit) are identified as being charged per mbps based on the amount of traffic exchanged between the networks. For example, it appeared that there may be some peering or IP transit costs that are incrementally incurred and/or unavoidable in order for a cloud provider to be able to provide egress data transfer services to any end user location. However, we noted that as cloud providers, CDNs, network service providers (NSPs) and ISPs increasingly interconnect and establish free peering and data transfer arrangements, the proportion of network spend on transit is likely to reduce. Our analysis also shows that transit costs comprise a relatively small proportion of wider networking and/or total costs for AWS, Microsoft, Google, IBM and Oracle.[68]

Q.41 Moreover, incremental egress costs for cloud-to-cloud data transfers, which applies to transfers for switching or multi-cloud purposes, appeared to be

[68] CMA analysis of responses to the CMA's information requests [✂].

avoidable when a cloud provider can negotiate settlement-free peering with the destination cloud network, at the relevant location.

Q.42 Our analysis of the extent of settlement-free peering arrangements for AWS, Microsoft, Google, Oracle and IBM and settlement-free connections [✂] in UK suggested that providing egress to some networks has no or very low incremental (per GB) connectivity cost for cloud providers.

Q.43 It was also not clear if there is a difference in how costs are incurred for ingress compared to egress. Ingress would seem to be justifiable as a one-time cost only if customers only ingressed data once; this did not seem applicable for customers that ingress multiple times due to multi-cloud or hybrid cloud (cloud and on-premises) use.

Q.44 Given this, it appeared that there may be some peering or IP transit costs that are closer to be being incremental in nature (as they are charged per mbps) in order for a cloud provider to be able to provide egress data transfer services to any end user location, but that as cloud providers, CDNs, NSPs and ISPs increasingly interconnect and establish free peering and data transfer arrangements, the proportion of network spend on transit is likely to reduce.

Analysis of egress cost-reflectivity

Q.45 We have examined the extent to which egress fees are reflective of cloud providers' relevant underlying costs of transferring data. To do this we have analysed cost data from cloud providers in order to understand their egress fees margins and the extent to which pricing differences between egress and other data transfer services (eg internal data transfers) are reflective of the difference in the cost of providing the specific service. Note, we have assessed the role of egress fees in funding investment and innovation (and by extension of this, the role in recovery of costs for investment and innovation) in Chapter 5.

Analytical approach

Q.46 In considering how to assess the extent to which egress fees are reflective of egress costs overall and differences in costs to other data transfer services, we considered that the following could be useful indicators:

(a) Margin analysis: comparison of total relevant costs incurred in providing egress data transfers to total egress revenues, to determine margins achieved. Whilst we did not necessarily expect margins to be zero in order for egress fees to be broadly cost reflective, we were interested in whether margins may be considered high. As a starting point, we have used our

estimate of cloud providers' cost of capital of 10% to 14%[69] for their wider service (ie provision of cloud services) as an indicative benchmark to compare margins against.[70]

(b) Unit cost analysis: comparison of average relevant costs per GB egressed to egress fee list prices per GB and average egress revenues per GB. List prices and/or average revenues that are higher than average costs may be consistent with egress fees not being reflective of costs.

(c) Service comparison: comparison of revenues for internal data transfers to egress data transfers, given the common assets used and costs incurred in providing these services as set out earlier in this section. We compared the revenue differential between these services to transit costs given that transit costs have been the main egress-specific and incremental egress cost commonly identified by cloud providers and so should reflect the main cost difference between egress and internal data transfer services. Revenue differentials being higher than transit costs may be consistent with egress fees not being reflective of costs.

Q.47 We considered that use of total and average revenues for comparison to costs allowed the application of free tiers and any discounts for egress to be taken into account. If the costs for egress are higher than for other data transfer services, as submitted by AWS and Google,[71] then this would be captured in the cost data used for the margin, unit cost and/or service comparison analysis.

Q.48 Where possible we have used egress data exclusive of CDN services, as we understood that these are primarily used for data transfers to end users (eg streaming video content) and not generally used for customer switching or multi-cloud. When comparing to list prices for the main cloud providers, we have used the prices applicable for data transfers via the internet from London/UK and the lowest non-zero egress fee price in the pricing structure to be conservative.

Q.49 We have calculated indicators excluding costs which we do not consider to be relevant to assessing the cost justification for egress fees; namely, exclusion of indirect overhead costs (such as sales and marketing and income tax). We considered these indirect overhead costs to be general business costs which cloud providers have discretion over how to recover. We noted we have been

[69] See Appendix E.
[70] We acknowledge that margins (which have revenue as denominator) are calculated on a somewhat different basis to the returns on capital employed (which have capital employed as denominator) which we benchmark against our estimated cost of capital in our profitability analysis. Revenues and capital employed can be of a different scale, although from our profitability analysis of AWS' wider service we find AWS' revenues and total assets to be broadly around a similar level over the period of our analysis.
[71] AWS' response to the CMA's updated issues statement and working papers, paragraph 31; Google's response to Egress Fees Working Paper, 14 June 2024, paragraph 25.

unable to determine if the cost data provided by cloud providers is exactly like-for-like (including in relation to how they treat internal cost recharges).

Q.50 We have supplemented our analysis with data from cloud provider internal documents, where relevant.

Our analysis

Q.51 We set out our analysis for the following cloud providers below:

(a) AWS;

(b) Microsoft;

(c) Google;

(d) Oracle; and

(e) IBM.

AWS

Q.52 AWS does a full cost allocation for its data transfer services. We have used the revenue and cost data obtained from AWS (exclusive of CloudFront CDN) to calculate profit margins and unit costs for its egress data transfer services for 2019 to 2023. We also consider the trend from AWS' forecast revenue and costs for 2024, but give this less weight given forecast data is subject to more assumptions.

Q.53 As discussed above, we have excluded indirect business costs such as sales and marketing. [✂].[72]

Q.54 As such, we have calculated AWS egress profit margins using costs it has identified as direct costs only.[73]

Margin analysis

Q.55 AWS egress margins have been [✂] from 2019 to 2023. This indicated that [✂].

Q.56 [✂].[74] However, [✂]

Q.57 As a sensitivity, we have also calculated AWS' egress margins including indirect costs that AWS allocates to egress (except income tax). AWS egress margins

[72] AWS' response to the CMA's information request [✂].
[73] [✂]. We exclude income tax given that income tax will be based on current or prior period profitability for the business overall. AWS' response to the CMA's information request [✂].
[74] AWS' response to the CMA's information request [✂].

including indirect costs have been [✂] in the period from 2019 to 2023 and are [✂].

Unit cost analysis

Q.58 We have analysed AWS average revenues compared to average costs on a $ per GB basis for egress data transfers, using the same AWS direct cost data as above and AWS current list prices for data transfers out from Amazon EC2 to the internet, from the London region, after the 100GB/month free tier.

Q.59 AWS' average revenues per GB from egress have been [✂] than its average costs per GB for egress [✂]. [75] AWS' current list prices are [✂] AWS' average egress costs per GB over the period 2019 to 2023.

Q.60 It is our view that egress fees are not reflective of costs, as AWS' average revenues and list prices for egress are significantly in excess of AWS' unit costs for egress.

Service comparison to transit costs

Q.61 We have also compared the difference between AWS' current list prices for egress and for inter-region data transfers (which we calculate to be $0.030 per GB)[76] with AWS' average egress transit cost of [✂] for 2021 to 2023.

Q.62 We calculated that [✂]. Our analysis indicated that, based on revenues and list prices [✂].[77] We considered the difference between AWS' internal data transfer and egress fees revenue to be consistent with egress fee pricing not being reflective of costs.

Microsoft

Margin analysis

Q.63 Microsoft told us that it does not specifically monitor the cost of egressing data. However, we have identified the following evidence from Microsoft internal documents which we consider to be relevant:

(a) Internal 'Networking' documents show that Microsoft's gross margin for customer data transfer services and virtual network services was [✂] and forecast [✂] and that Microsoft describes the margins for its egress via ISP

[75] As a sensitivity, we also analysed average egress costs including indirect costs. Including indirect costs, the average cost figures (excluding income tax) were [✂].
[76] $0.05 per GB for data transfers out from Amazon EC2 to the internet, from the London region, greater than 150/TB/month (after the 100GB/month free tier) and $0.02 per for inter-region transfers. EC2 On-Demand Instance Pricing – Amazon Web Services
[77] [✂].

routing to be [✂].[78] Another internal 'Networking' document indicated that Microsoft's gross margins for egress in 'Zone 1' via ISP routing and egress via Microsoft Global Network routing were [✂].[79]

(b) Microsoft's internal transfer prices charged by Azure to other parts of Microsoft's business indicate that for FY24, Microsoft's internal price for egress is [✂] its egress list prices charged to customers.[80] The internal price for egress from Europe is [✂] Microsoft's current first tier of egress list prices charged to customers.[81] We would generally expect internal transfer prices to follow the arm's length principle, so that prices are comparable to a transaction between two unrelated parties.

(c) Microsoft's 'workload' gross margins, representing units of accountability for the Microsoft engineering teams (but which do not align with particular sets of Azure services), show Networking Services gross margins were [✂] in FY23, [✂] in FY22 and [✂]% in FY21.[82] Whilst Networking Services includes ingress, internal and egress data transfer services as well as other Microsoft networking services (such as CDN, VPN Gateway, Virtual Network and ExpressRoute private connections), in its response to our clarification request on this data Microsoft recommended viewing the gross margin of Networking Services as a proxy for Bandwidth (ie ingress, internal and egress data transfer services) and Virtual Network gross margins.[83]

Q.64 We have also calculated an estimated direct costs-only egress margin for Microsoft using revenue and cost data supplied. Microsoft provided egress revenues for its 'Bandwidth', 'ExpressRoute' and CDN services and provided a breakdown of the networking costs for the entire Microsoft Corporation. We estimated Microsoft's margin for egress (inclusive of Bandwidth, ExpressRoute and CDN) by allocating Microsoft's total transit costs and port charges and a portion of all other networking costs using the egress revenue proportion of Azure revenue. This has overstated costs for egress as the allocated costs are for Microsoft overall not just Azure and are before internal recharges, but it provided an indicative minimum level of egress margin using direct costs only.

Q.65 Our analysis indicated that this conservative estimate of Microsoft's egress gross margins has been between [✂] for financial years 2020 to 2023 and that margins are trending [✂].[84]

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[78] Microsoft's response to the CMA's information request [✂].
[79] Microsoft's response to the CMA's information request [✂].
[80] Depending on region and whether routed via Microsoft's network or the ISP network.
[81] The internal transfer pricing appears to be calculated using cost data for long-haul, metro and transit costs plus [✂] uplift for overheads. Microsoft's response to the CMA's information request [✂].
[82] Microsoft includes an allocation for internal use cost recovery [✂]. Microsoft's response to the CMA's information request [✂].
[83] Microsoft's response to the CMA's information request [✂].
[84] CMA analysis of Microsoft's responses to the CMA's information requests [✂].

Service comparison to transit costs

Q.66 We compared Microsoft's global transit costs to Microsoft's egress and internal data transfer revenues. We calculated that [✂]. Our analysis indicated that, on a total revenue basis, [✂]. We considered the difference between Microsoft's internal data transfer and egress fees revenue to be consistent with egress fee pricing not being reflective of costs.

Google

Q.67 Google does not track costs at an egress data transfer level. However, we have calculated estimated egress margins, unit rates and service comparison to transit costs using revenue and cost data provided by Google.

Margin analysis

Q.68 We have estimated Google's direct costs for egress by including:

(a) An estimate of global networking costs[85] that are attributable to egress, by multiplying the total global networking costs for Google Cloud by the portion of Google Cloud revenue that relates to egress.[86]

(b) An estimate of global compute and storage costs[87] that are attributable to egress, by multiplying the total global compute and storage costs for Google Cloud by the portion of Google Cloud revenue that relates to egress.[88]

(c) Global transit costs as provided by Google, which represent the costs Google has incurred on transit providers that have any UK capacity,[89] and assuming that these transit provider costs relate solely to egress services.[90]

Q.69 Google's egress margins (exclusive of CDN services) using the estimated direct cost allocations set out above have been [✂].

Q.70 Our analysis indicated that Google's egress margins on a direct costs-only basis have been [✂] for 2020 to 2023. [✂].

[85] [✂].
[86] Global networking cost attributable to egress = global networking costs x (egress revenue / total Google Cloud revenue).
[87] [✂].
[88] Global compute and storage cost attributable to egress = global compute and storage costs x (egress revenue / total Google Cloud revenue).
[89] The transit providers have incurred some costs in the UK and other costs globally. We have included their global costs in our analysis.
[90] We estimate the transit cost for non-CDN egress by using the non-CDN egress proportion of total egress revenues.

Q.71 We considered whether it was possible to estimate Google's egress margins including indirect costs as a sensitivity, however we have not received sufficiently detailed indirect cost data to perform this analysis.[91]

Q.72 We noted that Google's overall Networking segment operating margin (ie including indirect costs) was [✂] in 2022 and [✂] in 2023,[92] but as noted we do not have sufficient data to determine if this is reflective of egress operating margins. We gave little weight to these figures due to the range of services included in the Networking segment, of which external data transfer services[93] contribute [✂].[94]

Q.73 In a recent internal business case for Google's Cloud networking services, Google showed modelled gross margins on its Cloud Interconnect egress fees of [✂] based on its 2023 listed pricing and gross margins of [✂] based on Google's new pricing taking effect from 1 February 2024.[95] The document does not state what costs are included in the margin modelling and they may not be directly comparable to egress fee costs and margins. However, we noted that Google's egress fees for Cloud Interconnect data transfers are generally lower than general egress fees to the Internet (Standard and Premium tiers), although additional connection charges apply for Cloud Interconnect usage.[96]

Unit cost analysis

Q.74 We have analysed Google's average revenues compared to average costs on a $ per GB basis for egress data transfers (exclusive of indirect costs) and Google current Standard Tier list prices for data transfers out from the London region, after the 200GiB/month free tier.[97]

Q.75 Google's average revenues per GB from egress have been [✂] its average costs per GB for egress in 2022 and 2023 [✂].[98] Google's current list prices have been [✂] Google's average egress costs per GB in 2022 and 2023.[99]

Q.76 It is our view that egress fees are not reflective of costs, as Google's average revenues and list prices for egress are significantly in excess of Google's unit costs for egress.

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[91] We note that [✂] of the costs allocated to Google's Networking segment are for [✂]. Google's response to the CMA's information request [✂].
[92] Google's response to the CMA's information request [✂].
[93] [✂]. Google's response to the CMA's information request [✂].
[94] CMA analysis of Google's response to the CMA's information request [✂].
[95] Google's response to the CMA's information request [✂].
[96] Pricing - Cloud Storage - Google Cloud, accessed 10 September 2024; Pricing - Cloud Interconnect - Google Cloud, accessed 10 September 2024.
[97] As at 10 September 2024, from All networking pricing - Virtual Private Cloud - Google Cloud.
[98] We use revenue and cost data inclusive of CDN services as the egress volumes data available is assumed to include CDN volumes.
[99] CMA analysis of Google responses to the CMA's information requests [✂].

Service comparison to transit costs

Q.77 We have used Google's egress revenues excluding CDN and global transit spend on all its transit providers that have any UK capacity.[100] We calculated [✂].

Q.78 Our analysis indicated that [✂].[101] We considered the difference between Google's internal data transfer and egress fees revenue to be consistent with egress fee pricing not being reflective of costs.

Oracle

Q.79 Oracle has provided its global 'outbound' data transfer revenues, which include metered data transfers between cloud regions from April 2023,[102] and its global costs of providing egress. Oracle has only provided costs for IP transit and 'backbone'. It has not identified any indirect costs or wider infrastructure cost allocations as relevant to include in our analysis. We also have data from an Oracle 'cost model' showing its unit cost for IP transit and backbone as at July 2023.[103]

Margin analysis

Q.80 We have calculated Oracle's data transfer margin using the data collected, which we consider to be broadly comparable to the margin data for AWS, Microsoft and Google using direct costs only.

Q.81 Oracle's global data transfer margin using direct costs only is estimated to be [✂] from 2021 to 2024.[104] Our analysis somewhat supported Oracle's submissions that [✂].[105] Oracle's data transfer revenues [✂].[106]

Q.82 Based on the cost model data Oracle provided, [✂].[107] This indicated a gross margin of [✂] on egress data transfers above the free tier (assuming no discounts), however as the analysis above suggests, this margin is offset by Oracle's free tier and potentially other discounts. [✂].

[100] The transit costs provided by Google represent its global transit spend on all its transit providers that have any UK capacity and may therefore understate total transit costs for any Google provider's that do not have UK capacity. However, Google's transit costs are likely to be incurred in providing CDN data transfers and the transit spend used could be overstated for the inclusion of CDN egress.
[101] CMA analysis of Google's response to the CMA's information request [✂].
[102] Oracle's financial year end is 31 May so this impacts FY24 and one month of FY23.
[103] Oracle's responses to the CMA's information requests [✂].
[104] CMA analysis of Oracle's response to the CMA's information request [✂].
[105] Oracle's response to the CMA's information request [✂].
[106] [✂]. CMA analysis of Oracle's response to the CMA's information request [✂].
[107] CMA analysis of Oracle's responses to the CMA's information requests [✂]; Cloud Networking Pricing - Oracle, accessed 4 October 2024.

IBM

Q.83 We have not been able to collect sufficient data (in particular, egress revenues) from IBM in order to undertake comparable analysis.

Q.84 However, using global cost data collected from IBM, we have compared the quantum of IBM costs to similar cost data for [✂]. Our analysis indicates that:

(a) IBM's transit costs are [✂];[108] and

(b) IBM's data centre costs for its total cloud business are [✂].[109]

Q.85 Given that some of IBM's egress pricing is broadly similar to AWS, Microsoft and Google and [✂], this indicated that IBM may also earn similar margins on egress to those identified for AWS, Microsoft and Google above.

Summary of analysis

Q.86 Our analysis has found AWS, Microsoft and Google to have estimated egress margins [✂], meaning that their revenues are [✂] their costs. We consider our analysis of AWS', Microsoft's and Google's egress costs to be indicative of their egress fees not being reflective of costs. Comparison of IBM's costs and egress pricing to other cloud providers indicates that IBM could earn similar margins on egress to those identified for AWS, Microsoft and Google.

Q.87 Oracle's [✂].

Q.88 We noted that this analysis considers the cost reflectivity of egress data transfer services (excluding CDN where possible) overall, or on average. However, as identified in our analysis that AWS, Microsoft, Google, Oracle and IBM all have some settlement-free peering in the UK and as submitted by Oracle,[110] there will be some data transfers such as egress from one cloud provider to another via peering which in some instances incur lower costs (but the same egress fees are charged to customers). Such egress data transfers could be even less cost-reflective for AWS, Microsoft, Google and IBM. This is particularly relevant to egress data transfers for switching and multi-cloud use.

[108] Responses to the CMA's information requests [✂].
[109] Responses to the CMA's information requests [✂]; [✂] response to Ofcom's information request [✂].
[110] Oracle's response to the Updated Issues Statement, 06 June 2024, pages 1-2.