

Federal Trade Commission
600 Pennsylvania Ave
Washington, DC, 20580

**Comment Submitted in Response to the FTC’s Request for Information
on the Business Practices of Cloud Computing Providers
Docket FTC-2023-0028**

The Institute for Local Self-Reliance (ILSR), a public interest research and advocacy organization founded in 1974, is pleased to submit these comments in connection with the Federal Trade Commission’s Request for Information about the business practices of Cloud Computing Providers.

As advocates for open, competitive markets that provide ample opportunities for new business entry and independence, ILSR is deeply concerned about high levels of concentration and anti-competitive business conduct within the cloud industry. Cloud infrastructure and services are the backbone of the modern economy. Nearly every industry depends on the cloud to function, including pivotal sectors such as healthcare and finance.¹ Digital services of all kinds, including live streaming and video-on-demand services, rely on the cloud. And rapidly-evolving technologies that are poised to reconfigure much of the American economy, notably generative artificial intelligence, are rooted in the computational and storage capacity of the major cloud providers. For these reasons, we believe it is critical that the FTC use its authorities to ensure fairness and robust competition in the industry.

I. Dominant Cloud Providers Have Durable Market Power and Persistently High Profits

The market for cloud computing infrastructure and services is highly concentrated among three of the largest tech firms, and indeed the largest corporations, in America. Those three companies, Amazon subsidiary Amazon Web Services (AWS), Microsoft’s Azure and the Google Cloud Platform, combined account for more than three-quarters of the cloud infrastructure market in the United States and 65 percent of the market worldwide.² Of those big three cloud computing providers, Amazon’s AWS is the clear leader, with a market share of about 40 percent, more than Microsoft and Google combined.³

¹ For example, see Sophia Furber, “As ‘big tech’ dominates cloud use for banks, regulators may need to get tougher,” S&P Market Intelligence, Aug. 18, 2020 (“A total of 69% of financial companies said they use AWS, 79% Microsoft Azure and 21% Alphabet Inc.’s Google Cloud Platform.”).

² Mark Haranas, “Amazon, Microsoft, Google Own 76 Percent Of US Cloud Market,” CRN.com, Nov. 15, 2022; “Big Three Dominate the Global Cloud Market,” Felix Richter, Statista, April 28, 2023.

³ John McCormick, “Amazon Maintains Lead in Cloud Infrastructure Market,” Wall Street Journal, June 28, 2021.

AWS's dominance in cloud computing extends to and includes the market for cutting edge businesses and startups in need of cloud infrastructure and services — including so-called “unicorn” startups that have high valuations because they are on a path to introducing significant innovations. AWS Chief Executive Adam Selipsky said in December 2022 that more than 90 percent of all cloud-based startups use AWS, while 83 percent of the more than 1,000 technology “unicorns” rely on AWS infrastructure and software.⁴

AWS also dominates the market for cloud services provided to federal, state, and local governments. More than 7,500 local and national government agencies currently use AWS.⁵ At the federal level, Amazon has won lucrative government contracts from the Navy, the National Security Administration, The Department of Veterans Affairs, NASA, and other agencies.

Persistently high profit margins among the dominant cloud providers suggests a lack of competition in this market. AWS in particular has persistently high profit margins. Its operating margins have hovered around 30 percent in recent years. In 2020, AWS reported \$13.5 billion in operating profit on \$45 billion in sales. Last year its take surged to \$23 billion in operating profit on \$80 billion in sales. It's also worth noting that the three largest cloud providers continue to grow rapidly. In fact, last year, their growth outpaced the overall worldwide growth in cloud computing services, meaning they gained market share.⁶ These persistently high margins and growth in share suggest the presence of durable market power warranting investigation and intervention by regulators.

II. Vertical Integration Across the Stack Impedes Competition

In addition to their enormous size, AWS, Microsoft Azure, and Google Cloud Platform are vertically integrated in the cloud computing stack of infrastructure, platform, and software. Whether cloud customers are using a platform, such as a machine learning service, or software, they indirectly require and are using the provider's infrastructure. Infrastructure, including data centers, servers, maintenance, and energy, among other costs, are extremely capital-intensive to build and expensive to operate. Amazon alone has more than 125 data centers around the world.⁷ The company plans to invest a further \$35 billion in growing its data center footprint by 2040.⁸ These high capital costs create major barriers for new entrants looking to compete with the dominant providers in the provision of cloud infrastructure.

⁴ Naina Sood, “83% Unicorn Startups Run On AWS; CEO Adam Selipsky Pitches to Invest in Cloud During ‘Uncertain Times’,” *YourStory*, Dec 1, 2022.

⁵ “The Trusted Cloud for Government,” aws.amazon.com, accessed Jun 21, 2023.

⁶ “Global cloud services spend hits US\$55.9 billion in Q1 2022,” *Canalys*, Apr. 28, 2022.

⁷ Mary Zhang, “Amazon Web Services (AWS) Data Center Locations: Regions and Availability Zones,” *Dgtl Infra*, June 15, 2022

⁸ Mark Haranas, “AWS Pouring \$35 Billion In Data Centers Amid Amazon Layoffs,” *CRN Magazine*, Jan 23, 2023.

Because it is less costly for companies to enter and compete in the market for software and platform services, we should see much more competition in these markets. However, the major cloud computing providers are all vertically integrated, which enables them to leverage their dominance in cloud infrastructure and the integration of their product offerings throughout the stack in ways that make it difficult for third parties to break into the markets for software and platform services.⁹ As we explain below, the dominant cloud computing providers, in particular AWS, use various forms of customer lock-in and exploitative conduct to create barriers to entry for rivals and limit competition.

III. Dominant Cloud Providers Erect Barriers to Switching and Multi-Cloud

Barriers to entry in the cloud computing provider market are very high. But multiple tactics AWS and other dominant providers use to lock in cloud computing customers erect even higher walls for new providers to enter and compete. We particularly want to underscore how these tactics impede multi-cloud use by customers, which would open the way for small innovative firms to successfully enter and compete to provide applications and services for particular functions.

A. High Egress Fees Inflate the Cost of Switching and Using Multiple Clouds

One pernicious form of lock-in among the dominant cloud computing providers is the fees they charge customers who want to move their data off of their servers, either to another cloud provider or to their own hardware. These fees, known as “egress fees,” are so high they discourage users from switching to another cloud provider for all or part of their needs.

Because of Amazon’s considerable share of the cloud computing market, Amazon is able to charge supra-competitive prices for egress beyond what its rivals charge and far beyond what Amazon pays to access and transit data on the public internet. These supra-competitive prices to move data from the AWS cloud to another cloud or to hardware serves as a form of lock-in for AWS customers that “can make a cloud project so expensive that it’s no longer viable.”¹⁰ For example, according to researchers at IT management company Cloudflare, the wholesale cost of internet transit has fallen by about 25 percent every year for the past decade, making it 93 percent less expensive than it was 10 years ago. However, over that same time period, Amazon’s egress fees have fallen by only 25 percent in total.¹¹

Amazon’s egress transfer fees confer de facto monopoly power on Amazon and AWS, because many clients who would like to shift some or all of their data and operations to a competing cloud become penned in by Amazon’s exit tax for leaving AWS. Companies may remain with AWS largely because

⁹ See generally, “Market Study Cloud Services,” Netherlands Authority for Consumers and Markets, 2022 (“For new entrants it is unrealistic to start from scratch and compete on all layers with an extensive product offering,” p 51).

¹⁰ Stephen Pritchard, “Cloud egress costs: What they are and how to dodge them,” ComputerWeekly.com, Jan. 23, 2023.

¹¹ Matthew Prince and Nitin Rao, “AWS’s Egregious Egress,” Cloudflare Blog, Jul. 23, 2021

it's too expensive to leave, even when there are more innovative, suitable, or affordable services elsewhere.¹²

Amazon's egress fees amount to an astronomical markup on the cost of transmission. The Cloudflare analysis shows that, in the US and Europe, Amazon marks up transit costs nearly 8,000 percent for egress bandwidth.¹³ Not only do Amazon's transmission fees lock in customers to AWS even when they would prefer to move to another cloud provider or to their own servers, but it creates a source of monopoly-level profits for Amazon when customers do move data from AWS servers.

These prohibitive egress fees act not only as a barrier to switching clouds completely, but they also prevent AWS clients from using services on multiple clouds. Because of the fees, those customers who would prefer to use various cloud services, because of those services' price, innovativeness or appropriateness, instead remain locked into their primary cloud provider and use services that may be more expensive or lower quality. For example, if an AWS client wants to use a less expensive service on another cloud, such as Google or a smaller cloud provider, the high cost of migrating their data away from AWS may erase the money they would have saved using that less expensive service, keeping the AWS client locked into the AWS ecosystem and eliminating the most likely source of competition within the cloud computing industry: the competition for cloud-based services and platforms.

B. Lack of Interoperability Impedes Switching and Multi-Cloud

Cloud-based software and applications must be able to communicate with data servers in order to function properly. Interoperability is crucial if a customer wants to run its operations on a different cloud or integrate operations across multiple cloud providers.

Lack of interoperability for services provided by the dominant cloud services has created technical barriers to both switching cloud providers and integrating operations across multiple providers, thus inhibiting competition. AWS owns and operates software that runs on Amazon infrastructure and is often fully interoperable with other AWS software at different layers of the cloud stack. However, many of the in-house applications offered by AWS, including data management software, is not interoperable outside of the AWS ecosystem. For example, Amazon applications such as Athena, RedShift, Omics, and SageMaker are compatible only with Amazon S3, its object storage service. This lack of interoperability means switching to or integrating services provided by a competing cloud can be prohibitively expensive and difficult.¹⁴

¹² See generally, "Cloud services market study; interim report," Ofcom, April 5, 2023 ("We have also heard concerns from some customers about their ability to switch and use multiple providers, which limits their access to the best quality products.").

¹³ Ibid.

¹⁴ "Market Study Cloud Services," Netherlands Authority for Consumers and Markets, 2022, p 5 ("Poor interoperability reinforces lock-in because users will also have to use the same provider or a third-party service running on the same cloud infrastructure for new services that will have to work together with existing services. As a result, users have less

Multiple studies have shown that another factor greatly contributes to the lack of interoperability between cloud providers: The lack of open and available APIs for product developers.¹⁵ Dominant providers often build in-house services using open source APIs, which customers use because they are more visible or promise interoperability. However, those dominant providers change parts of the API or otherwise change functionality so that the software is very difficult to integrate with other providers' services.¹⁶ Users of various cloud services become locked in, either to one cloud entirely, or into a siloed multi-cloud system in which they must use multiple products over multiple infrastructure providers that cannot communicate or interact with one another without significant resource investments. In this case, "It is not possible for users to combine services, or users are unable to make the optimal choice for the best service for a specific need."¹⁷

C. Bundling and Pricing Strategies Limit Competition

Along with steering users to their own products, AWS and the other providers often offer customers discounts for using multiple products across the cloud stack, and for entering into long-term contracts that require customers to reach some threshold of money spent on services.¹⁸ For AWS and other dominant providers, these contracts can effectively block competition by incentivizing customers, especially larger companies, to use a single provider rather than taking a multi-cloud approach.

IV. AWS Leverages Its Infrastructure Dominance to Preference Its Own Applications and Copy the Products Developed by Independent Software Providers

As with third-party sellers compelled to use Amazon's retail platform to sell their products online, AWS's dominance in cloud computing has compelled independent developers to offer their applications on AWS's marketplace. This entails agreeing to Amazon's surveillance and access to their data and may also entail agreeing to restrictions on promoting their own products elsewhere.¹⁹ The gatekeeper power AWS has over access to cloud customers, and its ability to exploit the data of rivals whose applications and services run on AWS infrastructure, creates a ripe opportunity for aggressive self-preferencing and appropriation of competitors' ideas and insights.

freedom to combine services of different providers. This creates switching barriers and limits competition at the service level between different cloud providers.")

¹⁵ Ibid, p. 57

¹⁶ "Cloud services market study; interim report," Ofcom, April 5, 2023, p. 103 ("in some cases these hyperscalers might initially build their cloud services on open cloud technologies (e.g. open standards and open APIs) but then tweak them (for example, changing some parts of the APIs, or changing certain features or functionalities). As a result customers using these services may need to rewrite some of their code if they wish to switch or multi-cloud.")

¹⁷ Market Study Cloud Services," Netherlands Authority for Consumers and Markets, 2022, p. 5.

¹⁸ Cloud services market study; interim report," Ofcom, April 5, 2023, p 9

¹⁹ Daisuke Wakabayashi, "Prime Leverage: How Amazon Wields Power in the Technology World," The New York Times, Dec. 15, 2019.

As noted above, AWS and other dominant cloud computing providers leverage their dominance in the provision of cloud infrastructure to steer customers to their own services and platform products at other layers in the stack.²⁰ For example, in AWS's Management Console, which users see when they log into AWS, the vast majority of service options displayed on the page are first-party AWS products.²¹ One account described the Management Console as being filled with about 150 different software products users could add with one click. All were AWS's own proprietary offerings, and when users searched for other, independent products within the Console, they were instead offered an AWS version that was compatible with the sought-after software.²²

AWS also has a documented history of creating in-house software that copies features of, and directly competes with, independent third-party applications that have been offered through AWS's marketplace.²³ For example, in 2019 AWS launched DocumentDB, a database management tool that closely mirrored MongoDB, an existing and popular database manager that had run on AWS for the previous two-and-a-half years.²⁴ MongoDB's share value plunged after AWS introduced DocumentDB.²⁵

AWS also charges users of third-party software a fee for transmission of data between its many physical data facilities. But AWS does not charge a similar fee for users who opt for AWS applications. So, for examples, users who prefer MongoDB, for example, will pay fees simply for implementing the software, while AWS' DocumentDB incurs no such fees.²⁶ The same applies across AWS; users pay to implement third-party software, while AWS' first-party offerings run for free. "AWS has taken advantage of its position as 'the only data transfer option in town' in their environment to benefit their own competitive offering."²⁷

The appropriation and self-preferencing of the dominant cloud providers has had a notably harmful effect on the market for open-source software. The development of open-source software has been a significant source of innovation and new competition. Among other benefits, it enables smaller firms to offer their software for free, thereby encouraging customers to try it, and monetizing their

²⁰ "Cloud services market study; interim report," Ofcom, April 5, 2023, p. 63 ("A strong position in the IaaS layer also provides the possibility of using the strong position to guide customers primarily to its own PaaS and SaaS services and to bundle these with IaaS services.")

²¹ Tom Krazit, "AWS has avoided antitrust scrutiny so far. Here's how that could change," Protocol, Feb. 12, 2021.

²² Daisuke Wakabayashi, "Prime Leverage: How Amazon Wields Power in the Technology World," The New York Times, Dec. 15, 2019.

²³ Sonya Mann, "Startups Beware: If You Use AWS, Amazon May Have You in Its Crosshairs," Inc., Apr. 27, 2017 ("The company's announcements at AWS events, both in the past couple of years and just last week, indicate a willingness to compete with startups that host their software on Amazon Web Services, as well as others that provide services and tools to AWS users.")

²⁴ Steven Melendez, "AWS launches MongoDB competitor amid criticism over Amazon's in-house products," Fast Company, Jan. 10, 2019.

²⁵ Jordan Novet, "Amazon launched a new cloud service that's sending MongoDB shares down," CNBC, Jan 10, 2019.

²⁶ Corey Quinn, "AWS's Anti-Competitive Move Hidden In Plain Sight," Last Week in AWS, Mar. 15, 2023.

²⁷ Ibid.

work by offering paid-versions that include additional features or support. On multiple occasions, Amazon has modified open-source software, creating its own versions that “fork” the software’s development and enable AWS to effectively take it over.²⁸ One respected open-source observer reported there has been a “long-standing trend of AWS rolling out managed services of popular open-source technology, or replicating such technologies” and then charging for it, while burying the open-source offerings.²⁹ One open-source investor said “It is clear that AWS is using its market power to be anti-competitive.”³⁰ The development of open-source software has since declined, diminishing an important source of innovation, cross-pollination of ideas, and competition.

V. Amazon Has Used Acquisitions to Cement Its Dominance in Cloud

Through an aggressive acquisition strategy over the past decade, Amazon has expanded and cemented the dominance of AWS in the cloud computing market. These acquisitions have given the company a sizable advantage over even its largest cloud rivals, allowed it to grow its portfolio of major clients, and enhanced its power to integrate its offerings in ways that thwart competition.

One notable example is Amazon’s use of technology it acquired through its 2015 purchase of Annapurna Labs to develop the Graviton microchips, whose speed and power have helped attract major clients, including Twitter and Adobe, to AWS servers.³¹ The acquisition has further entrenched Amazon’s power in cloud services, and helped drive market share and revenue growth for the company. Revenue from Graviton servers exceeded \$5 billion annually as of 2021.³²

Amazon has also completed scores of other acquisitions that have collectively expanded its reach and dominance in cloud computing. These include its purchases of TSO Logic, CloudEndure, Elemental Technologies, Cloud9 IDE, GameSparks, and Thinkbox Software.³³

VI. Amazon Exploits AWS to Advantage Its Other Business Lines

AWS provides crucial cloud services to companies across an array of industries, including markets in which Amazon already operates and those that it may enter. This creates conflicts-of-interest

²⁸ Daisuke Wakabayashi, “Prime Leverage: How Amazon Wields Power in the Technology World,” *The New York Times*, Dec. 15, 2019; Andrew Leonard, “Amazon Has Gone From Neutral Platform to Cutthroat Competitor, Say Open Source Developers,” *OneZero*, Apr. 24, 2019.

²⁹ Andrew Leonard, “Amazon Has Gone From Neutral Platform to Cutthroat Competitor, Say Open Source Developers,” *OneZero*, Apr. 24, 2019.

³⁰ *Ibid.*

³¹ Kevin McLaughlin, “AWS Server Chip Becomes a Not-So-Secret Weapon Against Microsoft, Google,” *The Information*, Jul. 18, 2022.

³² *Ibid.*

³³ David Linthicum, “AWS acquisitions continue with focus to build on core services,” *TechTarget*, Feb. 27, 2019; Connie Loizos, “Amazon Acquires Elemental Technologies For A Reported \$500 Million In Cash,” *TechCrunch*, Sep. 3, 2015; Deborah Laloum, “List of Amazon Acquisitions (So Far!),” *Bringg*.

and raises several serious concerns about how this integration across business lines can be used by Amazon to undermine competition.

One issue is that Amazon can cross-leverage AWS and its other business lines in anti-competitive ways. In 2020, for example, Warner Media agreed to renew its AWS contract in exchange for Amazon carrying its HBO Max streaming service on Amazon's Fire TV.³⁴

Another is that the market intelligence that Amazon gleans from providing cloud services can help it move into new industries with a built-in and unfair advantage. Rather than competing on the merits, Amazon can exploit the knowledge it gains through companies' use of AWS services. One area of concern, for example, is the healthcare sector. AWS has launched a number of cloud-based services for the health care industry, such as a medical transcription service that relies on machine learning.³⁵ At the same time, Amazon has been expanding as a health care provider itself through acquisitions such as One Medical.

Finally, Amazon can charge its direct competitors in its non-cloud business lines for cloud services, while presumably giving itself a significant discount on those same services. Amazon's retail platform, for example, may not pay the same rates for AWS that competing retailers pay. Another notable example is in live streaming. When Amazon acquired the market-dominating live video streaming platform Twitch in 2014, it also acquired the technology behind the AWS-based Amazon Interactive Video Service (IVS).³⁶ That technology has become the backbone of Kick, a new live video streaming service that is Twitch's most direct and significant rival.³⁷ This means that Amazon competitor Kick must pay sizeable fees to Amazon for cloud services, including the pivotal IVS service, while Twitch likely pays much less for these same services.

VII. Major Cloud Providers Control the Development of AI and Stand to Gain More Power Across Society as AI is Deployed in a Broad Array of Uses

New developments have put AI on a trajectory to rapidly and perhaps radically transform many industries and areas of daily life. Absent intervention, the expansion of AI will further entrench the market power of the dominant cloud computing providers, as only they currently have the compute power, financial resources, and massive data sets needed to develop and train AI models.³⁸ Because of these high thresholds, smaller AI companies must partner with one of the large cloud providers to viably develop and offer AI products, as Open AI did with Microsoft.

³⁴ Jessica Toonkel, "WarnerMedia Extended AWS Deal to Win Key HBO Max Concession," *The Information*, Jan. 8, 2021.

³⁵ "Christina Farr, Amazon lets doctors record your conversations and put them in your medical files," *CNBC*, Dec. 2, 2019.

³⁶ Taylor Soper, "Amazon uses Twitch technology for new AWS live interactive video service," *GeekWire*, Jul 16, 2020

³⁷ Calum Patterson, "Kick is 'burning money' paying for Twitch's streaming service from Amazon," *Dexterto*, Apr. 13, 2023.

³⁸ "2023 Landscape," *AI Now Institute*, April 11, 2023. ("[AI] is foundationally reliant on resources that are owned and controlled by only a handful of big tech firms."); Lina Khan, "We Must Regulate A.I. Here's How," *The New York Times*, May 3 2023.

Not only is there a high risk that the dominant cloud providers will monopolize the AI industry, but with these technologies poised to transform many sectors and services, the major cloud providers have an unprecedented opportunity to leverage AI to exert new control over other parts of the economy and extend their reach and power into our lives in novel ways. These concerns deserve urgent attention from policymakers and law enforcers.

VIII. Suggested Actions for the FTC to Take

In order to address these significant market power problems and promote competition in cloud services, as well as AI, we urge the FTC to consider several actions:

- Pursue structural separations, including spinning off AWS from Amazon's other business lines, thus eliminating opportunities and incentives to leverage its dominance in cloud to advantage its other business lines and vice versa.
- Additionally, examine the potential for separations that block major cloud providers from vertically integrating the layers of the stack, thereby blocking their ability to exploit their dominance in infrastructure to impede competition with rival providers of software and other cloud services.
- Vigorously enforce existing antitrust laws in the cloud sector, including the FTC Act, which prohibits unfair methods of competition. Enforcement should address anticompetitive practices such as bundling, egress fees, and lack of interoperability.
- Closely examine and monitor the expansion of AI to ensure that companies comply with existing competition and consumer protection laws.

Thank you for opportunity to respond to this information request and for taking the time to consider our comments. We would be happy to provide additional information and perspective as needed.

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