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Publishing

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Published on October 18, 2023

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EMERGING TECH RESEARCH

SWOT Analysis for Cloud Gaming Startups

How gaming startups could thrive or wither in the era of streaming technology

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Market overview

Cloud gaming refers to the streaming of high-quality games from cloud servers. The current cloud gaming market generates \$2.4 billion from 32 million consumers—approximately 1% of the gaming market. Estimates indicate cloud gaming could reach \$8 billion by the second half of the decade.¹ Early indications of cloud gaming's potential percolated over 20 years ago with the founding of OnLive and Gaikai. Two decades later, Microsoft's proposed acquisition of Activision Blizzard, the industry's largest-ever merger, was blocked by the UK's Competition and Markets Authority (CMA) over concerns that it would create a monopoly in the burgeoning cloud gaming ecosystem. Subsequently, the EU and the Federal Trade Commission either approved the merger or failed to block the deal, which eventually closed in October 2023.

These events have resurfaced debate about cloud gaming's long-term potential. While analysts who are bullish on the industry point to infrastructure improvements as a meaningful accelerant that can deliver cloud-streamed gaming (CSG) to underserved consumers, skeptics highlight indefensible unit economics driving an unclear value proposition. Nevertheless, demand for CSG appears solid, with surveys indicating that one-third of "committed" gaming consumers have experimented with cloud gaming services (compared with 10% of casual gamers), and over 80% are willing to use the service again.²

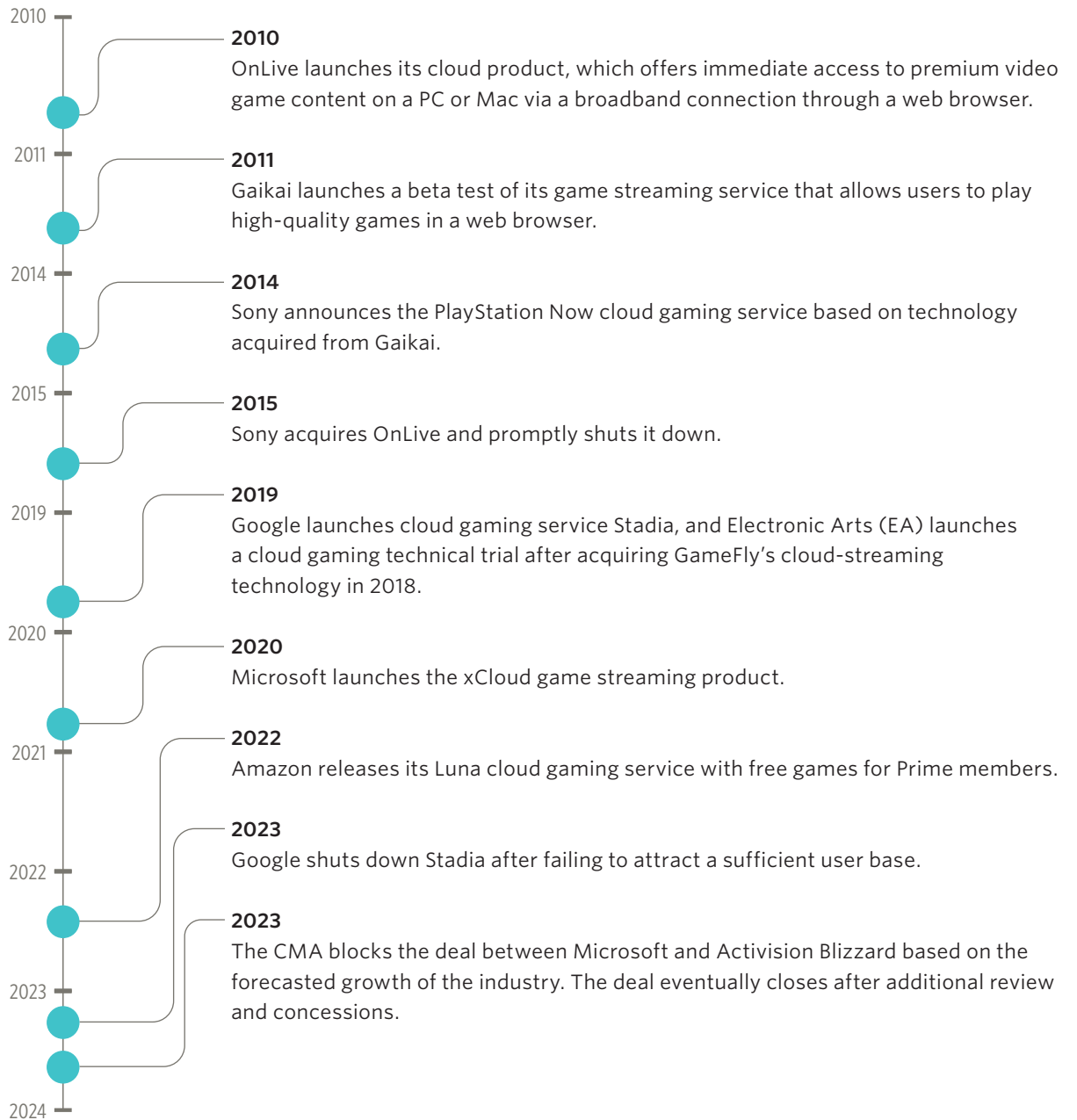
While cloud gaming services will continue to garner investor interest, market sustainability is unlikely until performance requirements are met, which could take the remainder of the decade. Cloud gaming is a decidedly customer-centric distribution model as a result of users consuming games on demand, free of hardware restrictions. However, considerable infrastructure challenges still exist after more than 15 years of development.³ Startups providing infrastructure and technology services to developers that help bridge the digital divide will continue to be feasible investments. Although novel, cloud-native games are compelling in theory, and this category remains largely undeveloped. If the CSG market fully materializes, the likely winners will be large technology companies that own the necessary infrastructure and content to mitigate challenging unit economics.

1: "Cloud Gaming Revenues to Hit \$2.4 Billion in 2022, up +74% Year-on-Year; Revenues Will Triple by 2025," Newzoo, Emma McDonald, October 12, 2022.

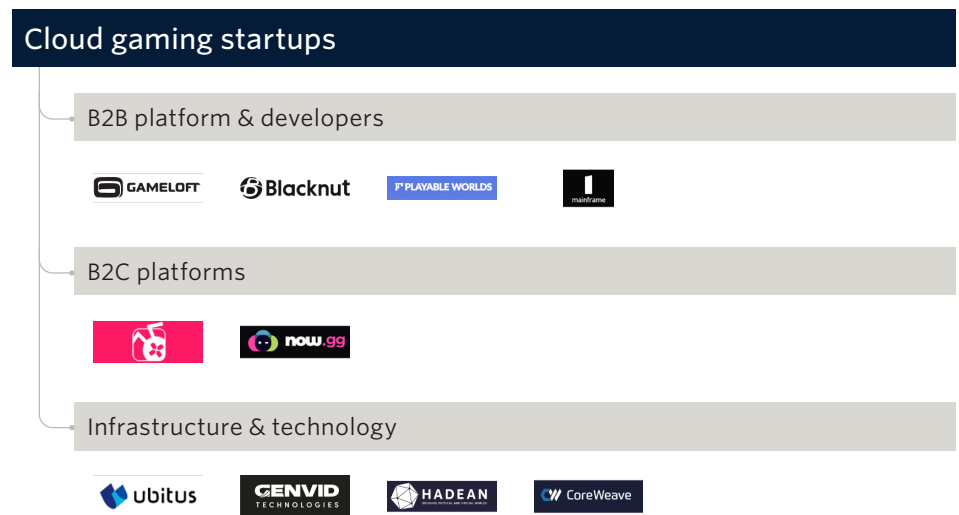
2: "Report: One-Third of Gaming Consumers Have Used Cloud Gaming Services," GamesIndustry.biz, Jeffery Rousseau, September 12, 2023.

3: "Crisis Core," GamesIndustry.biz, Matt Martin, April 6, 2009.

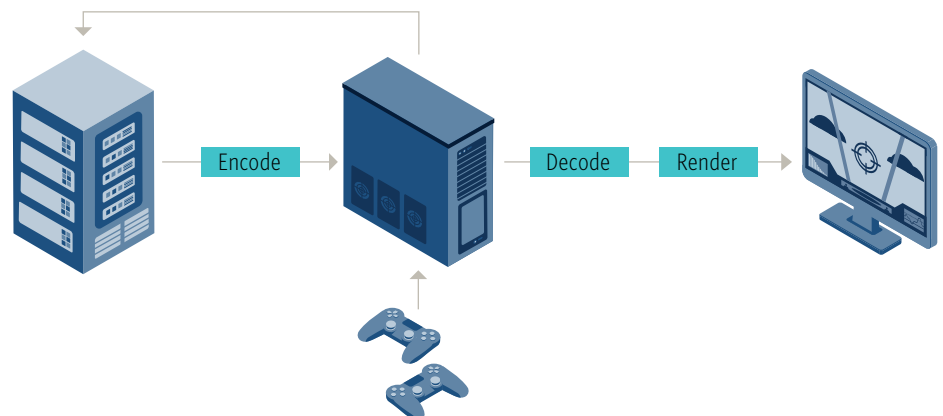
Cloud gaming timeline



Cloud gaming overview



Cloud gaming data flow



Source: PitchBook

It remains challenging to accurately describe the cloud gaming market. The CMA’s stance that CSG warranted protection as a standalone market was one reason for the initial blockage of the Microsoft-Activision merger. Others argue that, while cloud gaming can be offered as a feature, platform, component, or input, it does not constitute a market.⁴ From this perspective, companies fit into the aforementioned categories depending on their business model, whether a CSG experience is a standalone or bundled offering, and how vertically integrated a service is.

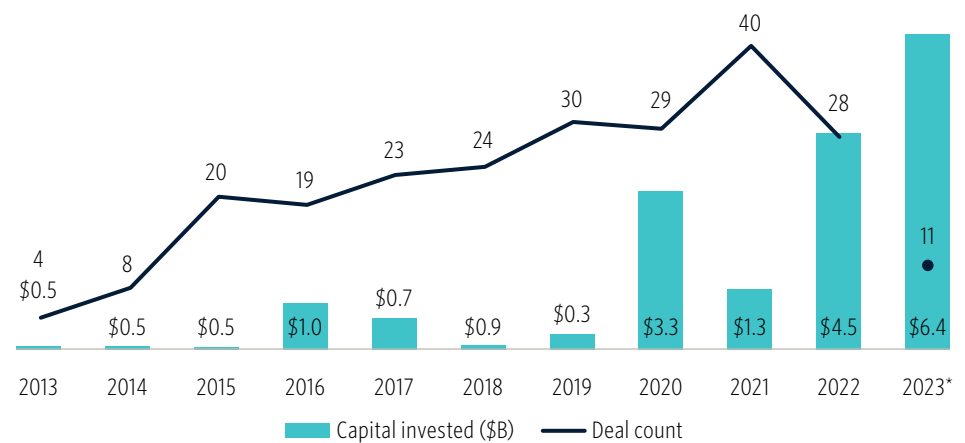
Based on our research, we introduce another framework focused on the startup landscape, which can be organized into three categories: back-end infrastructure and technology providers, B2B services, and B2C platforms. Back-end platforms

⁴“Cloud Gaming Is Not a Distinct Market,” Competition and Markets Authority, Joose Rietveld, March 31, 2023.

include services like graphics processing unit (GPU) providers, data centers, content delivery networks, server orchestration, and more. Examples include CoreWeave, a Kubernetes cloud with GPU-supported workloads; Edggap, an automated deployment and server orchestration service; and Genvid Technologies, a software development kit supporting massively interactive live events.

B2C platforms include free, “freemium,” and subscription-based platforms for games. This is a highly competitive segment as startups battle alongside incumbent platforms, like Microsoft’s Game Pass or Netflix, for discretionary consumer spending. Emerging startups include Now.gg, a browser-based collection of free online games; Antstream Arcade, a platform for retro and classic arcade games; and Blacknut, a subscription platform bundling games for direct-to-consumer (DTC) access in addition to partnering with large telecom companies. B2B providers include studios that license cloud-native games and a variety of software-as-a-service providers. This cohort includes developers like Return Entertainment and white-label platforms like Wiztivi or CareGame.

Cloud gaming deal activity



Source: PitchBook • Geography: Global
*As of October 10, 2023

SWOT analysis

The following SWOT analysis provides an overview of key factors influencing the development of the cloud gaming industry:

Strengths

The widespread adoption of AI has the potential to manage data center energy efficiency, model player behavior, and reduce maintenance costs.

- Performance and infrastructure improvements:** For mobile devices, 4G connections offer minimum-viable performance, and games with low refresh rates are feasible with strong coverage. Global 5G coverage reached 35% in 2022, but access varies significantly by region.⁵ Estimates indicate 5G networks will reach 80% of the global population by the second half of the decade.⁶ Technology giants are also improving product offerings. Google launched WebGPU to support web applications using AI, and Amazon Web Services (AWS) launched AWS Wavelength to deliver low-latency performance to 5G devices. Peripheral hardware like smart TVs and handheld consoles are also increasingly capable. The widespread adoption of AI has the potential to manage data center energy efficiency, model player behavior, and reduce maintenance costs. Gaming has benefited from the continued improvements of GPUs, and incumbents continue to look to GPUs to address performance needs, as evidenced by recent patent filings from Sony.^{7,8}
- Cloud computing and AI-powered gameplay converge:** Generative AI has the potential to usher in a new era of personalized gameplay and has attracted significant venture capital interest in the process. This gameplay will be supported by large language models that accelerate character development, enable intelligent nonplayer characters that can adapt to user behavior, and allow for increasingly unique user-generated content as in-game assets. Combined with robust data collection and storage, minimal latency, and expansive computing power, a new breed of highly immersive games may become feasible.
- Improved customer centricity:** The core value proposition of CSG is that nearly any game can be accessed on any device. This can theoretically expand the user base of gamers and deepen engagement by serving on-demand content free of hardware restrictions. This lofty goal continues to attract innovation, as demonstrated by researchers at the Massachusetts Institute of Technology who produced a device called Ekho that synchronizes multidevice streaming and reduces gameplay lag to imperceptible levels.⁹

5: "5G Network Coverage Outlook," Ericsson, n.d., accessed October 11, 2023.

6: Ibid.

7: "Trends in GPU Price-Performance," Epoch, Marius Hobbhahn and Tamay Besiroglu, June 27, 2022.

8: "System and Method for Multi-Tenant Implementation of Graphics Processing Unit," United States Patent Application Publication, Mark E. Cerny, March 17, 2022.

9: "A System to Keep Cloud-Based Gamers in Sync," MIT News, Adam Zewe, August 31, 2023.

Weaknesses

The paradigm is fundamentally different from TV or music streaming, where a single instance may support hundreds or thousands of consumers.

- **Performance requirements:** Requirements for input lag vary—figures referenced in our conversations ranged from 50 milliseconds to 80 milliseconds—but ultimately must fall under 100 milliseconds, which few games can reach. Constraints include:

 - **Inconsistent 5G access:** The US has 95% coverage while Latin America has 8%.¹⁰ Further, networks are bound by the slowest connected player—if one user relies on 4G, all users experience lower performance. Midband standalone (SA) networks are the most viable network option for mobile CSG, but implementation remains far off. Network standards vary across providers and it is unclear how CSG games consumed across different SA networks will perform.
 - **Datacenter placement:** Users need to be as close to a server equipped with a GPU as possible, but access is limited. In recent years, less than half of Google Cloud zones were equipped with GPU servers, which are more expensive than CPU-only servers. The cost challenges are compounded because scaling access to CSG instances is 1-to-1, meaning an additional instance (that is, a set of cloud resources) is required for each additional player onboarded. This also says nothing of the spike in GPU demand wrought by the generative AI boom.^{11, 12} The paradigm is fundamentally different from TV or music streaming, where a single instance may support hundreds or thousands of consumers.
 - **Wallet size:** Given that “hardcore” gamers are unlikely to embrace CSG due to satisfaction with existing hardware, multiple investors pointed to markets like India or Brazil as intriguing, but the limited 5G coverage and reduced purchasing power in those markets undermines the near-term returns.
- **Business model uncertainty:** The cloud gaming discourse often conflates different distribution technologies and subscription services, resulting in a lack of clarity that has already bred unwanted scrutiny from the CMA. Spending on subscription services peaked in 2021, and advertising-based models are difficult to justify. Serving ads requires infrastructure improvements, ads cannot be served during gameplay as they are during streamed TV, and average per-user monetization in ad-based models is unlikely to cover the costs of scaling a game. Critically, one of Stadia’s pitfalls was a pricing strategy requiring users to purchase individual titles even if a consumer owned the title on another platform. Multiple sources we spoke with pointed to a hypothetical, Spotify-like disruption wherein a single platform could aggregate content, but the degree of coordination and capital required to orchestrate a storefront of this nature remains unlikely.

10: “5G Network Coverage Outlook,” Ericsson, n.d., accessed October 11, 2023.

11: “Cloud Gaming and Mystery of the Bad Business Cases: \$400 Billion Bad,” Polystream, Marek Rubasinski, n.d., accessed October 11, 2023.

12: “The Future of Cloud Gaming: Command Streaming as the Alternative to Video Streaming,” Polystream, n.d., accessed October 11, 2023.

The most pressing challenge remains breaking even on the cost of serving cloud-streamed games.

- Ambiguous financial incentives:** Streaming and subscription growth can theoretically minimize the need for console developers to build, iterate, and maintain hardware product lines—Xbox notoriously never generated a profit for Microsoft—but console sales amount to a \$50 billion business globally with billions more paid to console developers to bundle content.¹³ Conversely, market estimates for a fully mature CSG segment are less than \$10 billion. The risk of cannibalization is nonzero, but not significant. The most pressing challenge remains breaking even on the cost of serving cloud-streamed games. Presently, the only stakeholders that hold any competitive advantage are incumbent tech companies with infrastructure services, like Microsoft’s Azure or Nvidia’s GPUs and GeForce NOW.

Opportunities

- New user experiences:** Maximizing the utility of cloud gaming may require consumers to embrace new behaviors, akin to how mobile and free-to-play games are utilized “on the go.” In CSG, new experiences with spectator monetization and instant access across a variety of devices may also require new habits. Owners of intellectual property may also strive to more closely integrate digital commerce into gameplay. Brands have not been able to own the end-user relationship in video games, but CSG may increase the viability of this model. Nike’s utilization of its .SWOOSH program within EA’s sports games is one early use case.
- International growth:** Blacknut’s partnership with Saudi Telecom Company follows Public Investment Fund support for Savvy Games Group’s mission to build the Middle East and North Africa region into a gaming epicenter. Turkey also established a viable market after securing significant VC activity in 2022, despite slowing in consumer spending in 2023 due to currency fluctuations.^{14,15} China Mobile, China Unicom, and China Telecom all announced CSG offerings following the country’s 2019 5G rollout, and both Tencent and NetEase released CSG services at the time. Latin America similarly offers high gaming penetration, despite limited broadband infrastructure.¹⁶ In the US, the older adult population also presents an untapped market for casual CSG.¹⁷ Critically, the viability of many emerging markets depends on business models and pricing strategies.
- Cloud-native game development:** Cloud-native development could usher in new on-boarding flows and game narratives, as well as reduce reconfiguration complexity for studios. A relatively small cohort of studios has secured funding for cloud development, including Return Entertainment and Mainframe Industries. Accelerated cloud-native game development may be feasible via infrastructure available from Microsoft Azure, Google Cloud for Games, and others. Despite Stadia’s failure, Google’s attempt to blend social and gameplay

¹³: “Video Gaming’s Epic Battle in the Cloud,” Morgan Stanley, November 19, 2018.

¹⁴: “Turkey Crowned Europe Champ in Gaming Startup Investments,” Daily Sabah, Timur Sirt, July 22, 2022.

¹⁵: “Turkey’s Gaming Revenues Nearly Halved in 2022 Due to Lira Decline,” GamesIndustry.biz, Jeffrey Rousseau, April 4, 2023.

¹⁶: “Cloud Gaming Forecast to Grow Market Share Through 2026,” S&P Global, Neil Barnour, October 11, 2022.

¹⁷: “Achievement Unlocked: Grandmaster,” Konvoy Ventures, May 5, 2023.

experiences as a value proposition of CSG was meaningful. Massively interactive live events, as demonstrated by Reddit Place, Rival Peaks (a partnership between Genvid Technologies, Pipeworks Studios, and Facebook), and the record-breaking Pokémon Red crowd-play event via Twitch, all demonstrate this potential. Another driver could be gameplay that can only succeed via cloud computing resources. AWS' SimSpace Weaver, which manages computation, memory, and networking through Elastic Compute Cloud (EC2) instances, could support large-scale spatial simulations and push the ecosystem toward Metaverse experiences.

Threats

- Strong incumbents:** None of the FAANG companies have presented viable solutions, but incumbent platforms may allocate resources as infrastructure costs decrease and a break-even point is attainable. Several providers have a partial edge (Sony's content, Microsoft's Azure, Nvidia's GPUs) and moats that could present a material barrier to entry for startups. Similarly, incumbent platforms could opt for DTC offerings as an outgrowth of subscription offerings like Ubisoft+. Telecom companies are another provider cohort that already own infrastructure, and many simply leverage partnerships for distribution. Although Sony Music did not prevent the growth of Spotify, the competitive moats are not trivial.
- Customer expectations:** Games have remained less conducive to streaming compared with other forms of entertainment. Although physical discs seem archaic, digital sales in gaming only exceeded physical sales in 2019.¹⁸ Cloud gaming is in the crosshairs of Peter Thiel's 10x rule—consumers are largely satisfied with current experiences and cloud gaming has yet to offer the overwhelmingly superior experience required to justify the change in behavior. Microsoft's Phil Spencer also shed light on challenges in consumer price sensitivity after shelving the company's streaming-only "Keystone" console, having failed to reach a sufficiently low price point for the device.¹⁹ Content developers may also grapple with the ideal persona, which is more correlated with income than "hardcore" consumer status.²⁰
- Regulatory scrutiny:** Regulators across the globe continue to monitor the games industry. The CMA's blockage of the Microsoft-Activision merger is a recent example, but follows Meta's clash with the FTC over the Within acquisition, the European Parliament's recent vote to regulate the games industry,²¹ fines for data collection, bans on microtransactions, state intervention in China to curb gaming addiction,²² and more. The current outlook and the completion of the Microsoft-Activision acquisition are positive developments, but lawmakers will likely monitor the sector as games push further into the mainstream. Investors we spoke with felt regulatory intervention would not materially inhibit investment until the sector exceeded tens of billions of dollars in revenue, but the sector is likely to remain on the radar of regulators.

Consumers are largely satisfied with current experiences and cloud gaming has yet to offer the overwhelmingly superior experience required to justify the change in behavior.

18: "Why Digital Games Could Totally Dominate Physical Formats In Just a Few Years," IGN, Logan Plant, March 31, 2021.

19: "Xbox Shelved Keystone Streaming Console Because It Was Too Expensive To Produce," GamingIndustry.biz, James Batchelor, November 16, 2022.

20: "Worldwide Cloud-Streamed Gaming Forecast, 2022-2026: Mobile Gathers Momentum," IDC, Lewis Ward, September 2022.

21: "European Parliament Votes To Take Action Against Loot Boxes, Gaming Addiction, Gold Farming and More," GamingIndustry.biz, James Batchelor, January 18, 2023.

22: "China Keeping 1 Hour Daily Limit on Kids' Online Games," The Associated Press, Zen Soo, January 19, 2023.

- Uncertain total addressable market and serviceable obtainable market:** Improved access to high-quality games is a long-assumed value proposition of cloud gaming. Through CSG, consumers can theoretically enjoy top-tier content without high-end hardware, which could cost nearly \$600 between a console and a game. Improved unit economics are compelling while inflation is high, and though two-thirds of Americans cannot cover a \$400 emergency, consoles are already a mass-market product selling tens of millions of units annually.^{23, 24} While there likely is a market of consumers who want top-tier games but cannot afford a console, this is not necessarily a venture-scale user base. Some stakeholders we spoke with do feel the total addressable market is sufficiently large and identify tailwinds in the fact that 90% of the population is without a console, and the capabilities of peripheral devices, like smart TVs, are improving. However, the serviceable obtainable market is likely much smaller when factoring in performance expectations and content licensing.

Select VC-backed cloud gaming startups*

Company	Total raised (\$M)	Last financing date	Last financing size (\$M)	Year founded	HQ location
CoreWeave	\$2,781.4	August 3, 2023	\$2,300.0	2017	Roseland, US
StackPath	\$766.0	September 2, 2020	N/A	2015	Dallas, US
Now.gg	\$62.0	March 23, 2023	N/A	2020	Campbell, US
Ubitus	\$56.0	April 7, 2021	N/A	2007	Tokyo, Japan
Pragma	\$38.20	October 18, 2022	N/A	2019	Culver City, US
Mainframe	\$33.8	November 29, 2021	\$23.2	2019	Helsinki, Finland
Antstream Arcade	\$23.6	March 29, 2023	\$6.4	2013	London, UK
Return Entertainment	\$9.1	July 27, 2023	N/A	2019	Helsinki, Finland
Edgegap	\$8.1	November 10, 2021	\$7.0	2018	Saint-Jean-sur-Richelieu, Canada
Blacknut	\$5.5	June 21, 2022	N/A	2016	Rennes, France

Source: PitchBook • Geography: Global
*As of October 10, 2023

23: "Global Console Shipments Snap Losing Streak as Sony Delivers in Q1 2023," S&P Global, Neil Barbour, May 23, 2023.

24: "Two in Three Americans Couldn't Cover \$400 Emergency, Suze Orman Warns," Bloomberg, Mackenzie Hawkins, January 24, 2023.