



# Cloud gaming and the future of social interactive media

Moving gaming to the cloud may promise richer playing experiences and provider opportunities—if both parties are willing to commit

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# Introduction

Even as the streaming video wars heat up, two of the planet's most highly capitalized technology companies are marshaling forces to bring forth another wave of content disruption. This time, the beachhead is the estimated US\$150 billion global video game market<sup>1</sup>—and it may shape the future of media and entertainment.

**M**OST GAMES TODAY are downloaded and played locally on smartphones, gaming consoles, and PCs. Network connections support player accounts, in-game purchases, and social affordances, but the games themselves run on players' devices. Game companies build services around top game titles, enabling them to deliver continuous updates that add new gameplay and respond to audience feedback on social streaming services. In this sense, gaming has been expanding into the cloud for some time.

With cloud gaming, a game lives entirely in data centers and delivery networks, eliminating the need for downloads and transforming a user's device into, essentially, a connected high-resolution terminal, with tangible benefits for both player and provider. To enable this shift, cloud gaming services are leveraging hyperscale cloud capabilities, global content delivery networks, and streaming media services to build the next generation of platforms for interactive, immersive, and social entertainment. Top game companies are responding by announcing partnerships with the disruptors or plans to develop their own competitive solutions.<sup>2</sup> Many telecoms are working to determine how well their networks support the unprecedented requirements of shifting potentially billions of gamers onto streaming services.

But will players see the value of cloud gaming as a better or more affordable solution? And which category of player will make the shift: Mobile gamers? Immersive gamers? Esports enthusiasts? Nongamers? Each of these segments will likely place different requirements on the technology and the market.



With more than 2.5 billion gamers worldwide,<sup>3</sup> the opportunity and the impact may be considerable.<sup>4</sup> Cloud gaming could eliminate the need for specialized consoles while allowing gamers to play any game from almost any device; it could enable game companies to develop richer experiences supporting far more players; it could drive telecoms, internet service providers, and content delivery networks to significantly expand their capabilities while stoking demand for 5G; and it could shift the balance of power across the video game industry, placing top cloud gaming providers at the hub of the distribution pipeline.

But this is no simple next-generation update. Video games include some of the most complicated content yet to enter the streaming revolution, and as cloud gaming begins to scale, streaming technologies and telecom networks may find it difficult to deliver top gaming experiences on par with existing solutions. The video game industry is mature, and its success has only grown. It is

unclear whether the prospect of cloud gaming offers sufficient incentive for game companies and players to radically change how they create, distribute, and consume video games. Nevertheless, many technology and telecom companies are steadily moving into media and entertainment, and even game companies are beginning to think like broadcasters.

Indeed, some have dubbed cloud gaming “the Netflix of video gaming.”<sup>5</sup> This comparison may be instructive, but not for the ways many people think. Netflix introduced its streaming service in 2007 and in four years had exceeded 23 million subscribers—over 280 percent growth, mostly in streaming.<sup>6</sup> Few at the time recognized the value of streaming, so competition was minimal, and the company found it relatively easy to license content. Neither of these conditions exists today, and streaming video games is a much bigger technical challenge than streaming video.

# The technology: How does it work?

**O**N THE MARKET for years, services that stream games have been slow to take off, hampered by bandwidth and latency challenges.<sup>7</sup> Most games are purchased as hard media or are downloaded to a device—a smartphone, gaming console, or PC. When games are played locally, quality and performance can be controlled and optimized for the device: The game looks good and gameplay is adequately smooth. Additionally, online multiplayer games demand bandwidth among the players to coordinate actions: If some players fall out of sync, latency can quickly destroy the experience.

Cloud gaming moves content execution off the consumer's device and into the cloud. Similar to how video streaming services deliver content, the view of the game is streamed to the player's device via content delivery networks (CDNs) with regional points of presence near population centers. As with video, size matters: A small smartphone screen can display a good-enough game stream with considerably fewer bits than are required to render acceptably on a 55" 4K television. A larger stream consumes more bandwidth, placing greater demands on the user's connectivity. To manage throughput, cloud streaming services must dynamically adjust to deliver the fewest number of bits needed for the best experience on a given device.

With streaming video—for example, a movie—the content is the same for everyone watching, and it only goes downstream to the user. With video games, players continuously influence the media shown to them and each player is seeing a different view. While video streams can buffer to overcome lag, video games usually cannot. Most are fundamentally real time.

## Cloud gaming moves content execution off the consumer's device and into the cloud.

With gaming in the cloud, each time a player inputs an action, the system sends it back upstream to the game engine, traversing the network along the way. The game must then update the view to reflect the action and

send it back across the network to the players. This sequence must operate immediately and continuously for all players in the game, since for many games, any latency over 75 milliseconds or so can cause players and actions to fall out of sync.<sup>8</sup> For massively multiplayer online games, with hundreds or thousands of players participating together simultaneously, the challenge is amplified.

As they play, more gamers are also using messaging, audio chat, and even streaming video of their gameplay, sending yet more data upstream.<sup>9</sup> Mobile gamers may not notice such bandwidth challenges, but for immersive gamers, multiplayerers, and esports enthusiasts, it might not be enough to have the cloud—they may also need greater connectivity.

## The promise of cloud gaming— opportunity or inevitability

Cloud gaming services promise to untether gamers from specific hardware, and to allow them to access their accounts from anywhere, entering the same game from any capable device. Services suggest that by eliminating the need for players to buy a console or high-end gaming PC, lower-income consumers will be better able to participate, growing the number of players. They also aim to shorten the time between interest and engagement, making it simpler for spectators to convert to players—and for casual or infrequent players to upgrade their participation level.

Recommendation engines could enhance discovery to match interests with specific games or play styles. Downloading games would be unnecessary, with updates to existing games happening automatically in the background—a relief for gamers, more than three-quarters of whom are frustrated with downloading and updates, in both the time it takes and the potential for play interruptions.<sup>10</sup>

For game companies, a key promise of cloud gaming is to overcome the limitations of a player's smartphone, console, or PC. A game could be as large and complex as the cloud can handle, and

multiplayer games that typically cap player counts at 100 could expand to potentially thousands or more. Game companies would no longer need to manage purchases and downloads, even if they continue to control in-game purchasing. There could be a more direct line to player data, although it's unclear who would own that data in a streaming arrangement—or what share of in-game advertising delivery services may take. Potentially, new hybrid forms of entertainment—and new business models—could emerge on top of the new infrastructure.

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As we'll see, both the technology and the market face considerable challenges. For now, game companies may view new cloud gaming services more as competitors and disruptors than as partners. With the benefit of recent internet history, they may sense the inevitability of cloud gaming with the knowledge that changes in distribution may not favor the incumbents.

# Gaming segments and the state of play

TO BETTER UNDERSTAND the video game market, let's consider a set of four gaming segments that cloud gaming services, and the broader video game industry, are trying to address: **mobile gamers, immersive gamers, esports enthusiasts, and nonplayers.** Each segment imposes requirements on both the technology and business of streaming video games.

## Mobile gamers: The largest audience, the simplest games (for now)

By some estimates, mobile video gaming now accounts for almost half of the global US\$149 billion video game market, growing 10 percent year over year.<sup>11</sup> The largest driver of growth across the video game industry is from mobile gamers: More than 2 billion people worldwide now play mobile games.<sup>12</sup> According to Deloitte's 2019 *Digital media trends survey*, mobile gamers have the largest distribution across generations.<sup>13</sup> In 2018, mobile gamers contributed 74 percent of consumer spending in mobile app stores.<sup>14</sup> In a large and fragmented market of mobile games, some top titles have proven durable, maintaining popularity for several years.<sup>15</sup>

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With such size, cloud gaming providers may aim to tap the market for casual games—comparatively simple titles that fill idle time, suited to smaller screens and less precise interfaces—which have dominated mobile gaming.<sup>16</sup> They often feature puzzles, matching games, or simple exploration and discovery, and they have tended to be single-player. Requiring minimal commitment, casual single-player games are the most popular type of gaming globally.<sup>17</sup> From a technology perspective, this may be the easiest segment to address—one reason why China's Tencent and Alibaba are focusing their cloud gaming efforts squarely on that nation's nearly 700 million mobile gamers.<sup>18</sup>

But mobile gamers are getting expensive to acquire and convert, and they're not especially loyal, with high churn rates across titles.<sup>19</sup> Cloud gaming services could use this lack of commitment by, for instance, targeting casual mobile gamers with subscription models allowing them to regularly sample new games. Telecoms could potentially bundle access into their subscriptions based on preferred gaming style. Top console and PC game companies could better prioritize mobile as a key element of their franchises.

Notably, many game developers still see casual mobile gaming as a secondary or tertiary market with comparatively low returns compared to their top titles.<sup>20</sup> But mobile gamers seem to be moving toward more multiplayer and immersive games,<sup>21</sup> with some top console and PC franchises releasing successful mobile versions.<sup>22</sup> These games are more complicated, rendering richer environments, delivering

fast-paced gameplay, and synchronizing between many players. For such titles, mobile versions may offer a way for console and PC gamers to play their favored titles on the go—and, for companies, a way to convert mobile gamers into immersive and esports experiences.

## Immersive gamers: Realistic game worlds, big narratives, and online services

Immersive games feature as much realism as possible; players enjoy strong physics and environments that may come alive with weather, particle systems, and dynamic lighting. Such games have sophisticated AIs animating nonplayer characters—a game world’s digital full-time residents—and these characters often interact to produce unexpected emergent behaviors. With competition and player expectations rising, top AAA franchise titles<sup>23</sup> can take years to develop and upward of US\$100 million to bring to market.<sup>24</sup> They are attracting A-list actors looking for new ways to tell stories—and new ways to reach millions of people.<sup>25</sup> Many games offer rich narratives that unfold gradually, some with multiple branched endings, offering 60 hours or more of single-player,

story-driven gameplay. Increasingly, they include online multiplayer modes and additional downloadable storylines that help a game persist with continuous engagement and monetization for years after launch.

To enjoy such experiences with the greatest fidelity, many immersive gamers have invested in gaming consoles or high-end PCs capable of computing and rendering so much realism. The global video game console market is estimated at around US\$47 billion with 13 percent year-over-year growth, while the PC market has slowed to around US\$35 billion and 4 percent growth.<sup>26</sup> These figures help explain why big-budget, AAA franchise titles designed for PCs and consoles grab more attention than lower-impact mobile games. Indeed, when cloud gaming services promote their offerings, they often lead with the top immersive franchises.<sup>27</sup>

The focus on immersive gaming highlights the challenge for cloud gaming providers looking to not only match games’ current technical demands but offer new capabilities. All the detail and complexity of a big-budget immersive game must execute in the cloud and then stream to the player’s interface, often a large-screen TV or monitor rendering in high definition. With so much computation, the



cloud may not be the bottleneck—the network must do more heavy lifting, and it will still run up against the last mile into the gamer’s home. These challenges are amplified for persistent online multiplayer worlds hosting potentially millions of players.

To deliver rich experiences and low latency at scale for major multiplayer titles, cloud gaming services may require greater capabilities from CDN providers. They may also need to coordinate with telecoms to address rising bandwidth demands by identifying and targeting immersive gamers with better subscription offers, potentially partnering with networking companies that offer routers optimized for high-bandwidth gameplay. Additionally, immersive gamers may more readily adopt 5G services if they can see a performance boost with cloud gaming, either at home or on the go. However, with a new generation of consoles expected, immersive gamers may have little incentive to add another monthly subscription for cloud gaming services until they have established content and performance.<sup>28</sup>

Given the outsized impact of top-tier AAA franchises, and how much both PCs and consoles have successfully supported them, many may evaluate cloud gaming services on how well they can deliver immersive experiences. Supporting esports enthusiasts may pose even greater challenges.

## Esports enthusiasts: Fast-paced, massively multiplayer, spectator gaming

Many are familiar with *the rise of esports*—online multiplayer games in which players compete for rank and prizes.<sup>29</sup> With a global market estimated at US\$1 billion, esports is growing and grabbing attention. While professional

esports players number in the thousands, hundreds of millions of amateur enthusiasts compete as well, playing party games, battle royale, multiplayer online battle arenas, shooters, fighters, and digital versions of traditional sports. Esports titles are inherently social, with friends meeting up in-game and communicating over chat and audio headsets. Amid concerns of fads and fickle gamers, top esports titles have retained popularity for several years.<sup>30</sup>

Esports is also often a fast-paced spectator sport. Millennial gamers, for example, spend more time watching other people play video games than they do watching traditional sports on TV.<sup>31</sup> This is a testament to the popularity of competitive video games and the ability of social streaming services to broadcast play. While most video game revenues have come from software and micropayments, revenues for esports are from advertising and sponsorships.<sup>32</sup> Esports is blurring the lines between video games and TV, spurring game companies to think like broadcasters.

Of all game segments, esports enthusiasts may be the most sensitive to latency during gameplay, particularly if they are competing professionally. For this segment, cloud gaming services may need a robust core for execution, a strong and customized CDN for delivery of the experience, and advanced network capabilities to manage synchronization at scale. To this end, 5G and edge computing may play a growing role. Cloud gaming companies may benefit from partnering with telecoms to develop better end-to-end networks

**Millennial gamers, for example, spend more time watching other people play video games than they do watching traditional sports on TV.**

and drive 5G adoption, while exploring shared subscription models. Telecoms may need to expand their upstream capacity to better meet the needs of esports gamers who are also streaming video of their play. Ultimately, a streaming failure for a cloud-based mobile game might be excused. A failure with an immersive title on launch day will likely be punished. But a failure on game day for a top esports championship could be a major setback for a young cloud gaming service.

## The nonplayer: The vanishing slice beyond a mature global market

For the most part, the challenges with these segments boil down to convincing existing gamers that streaming can compete with downloads on

consoles, PCs, and smartphones, while delivering greater capabilities. However, cloud gaming services are promising to grow the number of players by lowering the barriers to entry. They suggest that the large growth of mobile gaming is because so many people want to play video games now, irrespective of global smartphone adoption and the ability of mobile apps to consume our idle time.

There are valid reasons for our gaming segments to consider cloud gaming. But with more than 2 billion players already happily gaming, removing the cost of consoles is not likely to expand the market. Setting aside nongamers, there remain many challenges in convincing a mature and successful video game industry to embrace a new distribution platform.

# Cashing in on cloud gaming

**C**LOUD GAMING WILL likely place new demands on existing networks for bandwidth and latency, both downstream and up. Will telecoms have the capacity and capabilities to effectively support cloud gaming for our gamer segments? Are there significant and unforeseen network requirements for, say, a massively popular immersive multiplayer game that can host 1,000-player instances around the globe? And can telecoms overcome potential limitations in the last mile to the player?

Although the global average for fixed downstream broadband is around 68 Mbps, expansion of cloud gaming may face uneven distribution of bandwidth.<sup>33</sup> One study says that 34 million “core gamers” in the United States are playing an average of 22 hours per week, and if they switched to cloud gaming, they would use over 1,300 GB per month just to play.<sup>34</sup> To meet the bandwidth needs of a growing cloud gaming market, further innovation and capex could be required across the telecom value chain, with gaming households potentially facing higher costs of connectivity.

Meeting greater bandwidth needs for cloud gaming could cause more competition among carriers that may change pricing models and offer incentives to attract and anchor more gamers. The costs of expansion could potentially ignite more telecom acquisitions of game properties. Telecoms may also face the brunt of complaints if streaming gameplay has too much latency.

Upselling customers to home 5G services could meet broadband demands for some gamer

segments—or even exceed them—while enabling richer experiences for mobile gamers.<sup>35</sup> Some analysts see China’s expansion of 5G as a large enabler of its cloud gaming industry, aiming squarely at its mobile-dominant video gaming market.<sup>36</sup> Broad adoption of 5G may be part of the future that cloud gaming services are aiming to meet on the horizon.

For game companies, deciding how much to support a new cloud gaming service may be a more difficult calculus. They must decide if new cloud gaming services are able to deliver high-quality experiences for their top titles, if the market is ready to pay for it, and whether they should partner with cloud streamers, rent cloud and CDN capabilities, or build their own delivery networks.<sup>37</sup> With considerable value accruing around their franchises, game companies may be well-positioned to control access to their audiences. The saying that “content is king” applies more than ever, underlined by recent IP consolidation in video content. Game franchises are no exception. Over time, players and audiences may likely follow the titles, regardless of distribution.

One of the top battle royale video games counts over 250 million registered users, reaching 10 million concurrent players on a few occasions.<sup>38</sup> The free-to-play game generated US\$2.4 billion in revenue for 2018 and has drawn over US\$200 million monthly.<sup>39</sup> So why does such a successful game, or its kin, need cloud gaming? And yet the vision of cloud gaming is compelling and seems ever closer to reality.

# Cloud gaming services: More than just game delivery

IT COULD BE said that the 2019 announcements from Google and Microsoft to deliver cloud gaming to the masses have lit a fire under the industry. Both have notable ways they are tying video games to their service and media plays. Google aims to use YouTube as the entry point for Stadia, enabling a viewer watching a streaming video of gameplay to then click and enter a cloud instance of the game. With YouTube, Google can leverage its existing audience, ad network, and social affordances—and tap into its top influencers. All of this may likely run on Google’s CDN. In essence, Google will expand its media business to include video games, anticipating more demand for its cloud and CDN

**Deloitte research also suggests that consumers are beginning to experience subscription fatigue.**

business in the process. For its xCloud service, Microsoft has the Xbox user base, mature game studios with top-tier gaming IP, and Mixer, its social streaming service. As a game company, Microsoft is one of few with hyperscale cloud and delivery capabilities.

These conditions suggest a more fluid, social, and interactive form of media and entertainment. The might of the cloud and CDNs could enable a near future of immersive, interactive, highly social, and competitive game worlds with virtual economies hosting brands, celebrities, influencers, and even politicians. But on the way to that future, cloud gaming services may need to work hard to show value to a robust video game market that may not see immediate incentives to move their IP to the cloud. Both technical and market success may be easier with casual mobile gamers, but this segment might not be enough to move an entire industry.

Notably, a Deloitte survey finds that 23 percent of the gaming population report as multiplatform players, dividing their time among mobile, console, and PC.<sup>40</sup> Cloud gaming services could focus in on these gamers with the promise of seamless play between platforms. However, Deloitte research also suggests that consumers are beginning to experience subscription fatigue.<sup>41</sup> An additional subscription for a cloud gaming service would



compete with other top subscription entertainment services.

Cloud gaming services may also look to anchor exclusive titles to boost sales. But this would require IP holders—game companies—to see value in going exclusive at a time when their games have become quite valuable. One scenario could see an outbreak of M&A activity with top cloud gaming services buying up game companies and making the IP exclusive. However, game companies are already starting to think like broadcasters and know the value of their franchises.

Cloud gaming services may leverage the reach of esports influencers to promote their services—analysts now measure a video game’s success not only on its play but its viewership.<sup>42</sup> Companies might also look to demonstrate esports events running solely on their networks—but they should ensure robust delivery. If the promise of cloud

gaming includes the ability to execute on limitless cloud resources, but delivery requires moving those resources closer to players, will providers need to expand computation at the edge? One could even speculate on a fundamentally new kind of interactive CDN designed for the convergence of narrative, multiplayer video gaming, and broadcast streaming services. Ultimately, the entrance of cloud heavyweights into game delivery could herald great change in more than just video games.

The phrase “Netflix for gaming” fails to capture the very real differences between streaming video and streaming video games. But it may be an accurate appraisal of how cloud gaming could unleash years of uncertainty, disruption, IP consolidation, and transformation across the media landscape. If previous content revolutions are a guide, cloud gaming may be the future. When it will mature and who will own what across the value chain remains to be seen.



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