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E BOOK

LEVEL UP:

Disruptive shifts
in high-performance
gaming

GAMING IS EVERYWHERE... AND GROWING

The global reach of gaming poses performance challenges and opportunities across industries
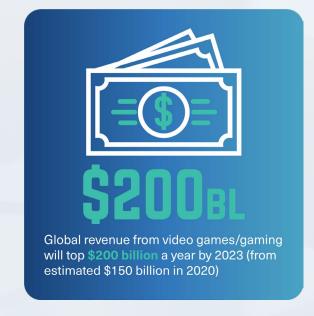
The dominance of gaming as an entertainment medium is undeniable. According to a DFC Intelligence report[1], more than 3.1 billion people worldwide play video games. This number, equaling about 40% of the world's population, continues to grow. Global revenue from video games/gaming will hit $200 billion USD a year by 2023 according to Juniper Research[2]. Almost half the world is gaming, and spending hundreds of billions of dollars on it. But it's more than just fun and games.

When major retailers' sites crash at the launch of a new console[3] or when leading American politicians[4] jump into the online video game fray to boost their clout and build campaign awareness, it's clear that gaming is not only part of the mainstream but a dominant force, a viable engagement platform, and potentially even a new political frontier.

Sources

[1] dfcint.com   [3] info.varnish-software.com

[2] juniperresearch.com   [4] arstechnica.com

3.1BL

More than **3.1 billion** people worldwide play video games.
This is about **40%** of the world's population

$200BL

Global revenue from video games/gaming will top **$200 billion** a year by 2023 (from estimated $150 billion in 2020)

GAMING IS EVERYWHERE…
AND GROWING

What was once the domain of physical video arcades and basic home gaming consoles has become a complex web of interactive, real-time gaming choices whose existence and success relies not just on avid gamers but also on:

- high-performance, low-latency gameplay in increasingly demanding and unpredictable circumstances

- easy, reliable access to downloads of increasingly large games, patches and updates

- e-commerce platforms being able to let gamers pre-order and purchase physical consoles and games without friction and downtime

- new and expanding modalities, e.g. everything from simple mobile gaming to complex multiplayer, real-time, virtual-reality gaming and everything in between

- securing game play from new threats[5]

- adapting to and adopting new technology, such as 5G networking, cloud gaming, etc. and ensuring the same smooth, immersive experiences

This e-book will take a look at these considerations through the lens of capturing the opportunities afforded by reliable and resilient performance and future-proof technology adoption and the inevitable challenges this may pose.

Sources

[5] theverge.com

BEYOND THE NAME OF THE GAME

Gaming was huge already, but the 2020 pandemic accelerated its growth[6], the frequency of play and helped it reach new audiences, as people were looking for new ways to entertain themselves in lockdown. As such, the reach of gaming as more than just a game continues to be felt globally, in the news and across industries.

More than half of the world's active gamers live in the APAC region (about 1.4 billion players), and more than half of these play solely on their mobile phones. Europe, Latin America and North America follow in terms of numbers of gamers. Gaming is a truly global phenomenon that has ripple effects but within and outside the gaming world. Some examples include:

- When New York Congresswoman Alexandria Ocasio-Cortez announced that she'd take part in her first-ever Twitch live stream, her appearance drew more than 430,000 concurrent viewers[7], during which she played

Among Us and encouraged fellow users to vote in the November 2020 election[8]. According to Twitch, this was in the all-time, top-ten game streams. We can get a glimpse here of the growing potential for live streaming and the technology needed to guarantee the low-latency, high-capacity, high-concurrency streaming during such peaks.

- When PlayStation 5 was launched for pre-order, disorder reigned for a number of major retail e-commerce platforms with site slowdowns and crashes reported throughout the pre-order event, demonstrating the need to scale up to be ready for anything.

- On game launch or update days, traditional CDNs could potentially face major downtime, slow performance and unhappy gamers. Downloaded games now comprise massive (several hundred gigabyte) amounts of data, and can take a long time to download. Add to the equation hundreds of thousands of concurrent downloads, simultaneously trying to log in and play, and you're

asking for trouble and unstable play. Most large gaming companies run their own gaming-specific CDNs or use commercial CDNs designed to cater to the needs of gaming studios to meet these demands.

- Mobile, cloud and edge are all components of various present-day gaming scenarios but also make up the building blocks of future 5G gaming endeavors. The 5G network opportunity is changing everything, encompassing many of the previously mentioned challenges of game content delivery and consistent performance because 5G can handle it all if the right technology is deployed. It's in that way not just about mobile, or cloud, or edge computing, although mobile will likely be the first place 5G's impact is felt.

Sources

[6] qz.com

[7] theverge.com

[8] technologyreview.com

LET THE GAMES BEGIN:
Technologies powering gaming

The technology companies, and technologies, powering gaming have also been feeling the surge in gaming popularity and the demand for continued innovation. The predominant areas in which gaming faces challenges and opportunities include, in part, the following list, and while each may operate on its own, many of these segments work together to enable a more complete gaming ecosystem. This cross-platform convergence will likely become more tightly knit as the technologies — and games themselves — evolve.

Video game streaming

Video game streaming encompasses many aspects of the current and future gaming frontier and is at the core of the gaming revolution. This in turn relies on advanced hardware in cloud data centers that "receives player input and transmits video output to the player's computer or mobile device as required — rather than running the game on the device itself"[9]. Yes, this is video game streaming — and it is intertwined with and based on cloud technology. Cloud streaming is resource intensive[10], and will make significant demands on networks. According to Deloitte, for reference, streaming video requires a 25Mbps connection to stream 4K video while cloud gaming via, e.g. Google Stadia[11], will require a 35Mbps connection for a consistent 4K service.

This level of resource demand will also be required assuming that e-sports and e-sports tournaments take off in the next couple of years[12], and will have to not only work seamlessly from a streaming (technical) point of view but will also have to pay dividends as different platforms, such as Twitch or YouTube pay vast sums for streaming rights.

Sources

[9] telecoms.com

[10] deloitte.com

[11] extremetech.com

[12] pcmag.com

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E-commerce and gaming

It might seem counterintuitive to bundle e-commerce together with gaming, as most growth in the gaming sector is online. Yet there is a deeper connection between e-commerce and gaming than would be immediately apparent. The link is more than the tenuous physical game purchases on traditional e-commerce platforms, and is increasingly interwoven into the gaming experience itself. There are a number of ways e-commerce technology is inextricably tied to the present and future of gaming.

Particularly in 2020, people continue to purchase the latest generation in console games as well as physical games via e-commerce channels. And the demand for game consoles as they are released, while it should be predictable, does not always go smoothly in practice. When PlayStation5 pre-orders were made available at the last minute in September 2020, a number of major e-commerce sites crashed when overrun by traffic they hadn't planned for. Consumers ended up facing uncertainty with failed or incomplete purchases, broken links, disappearing orders, page timeouts and site downtime. Retailers experienced complete site crashes at worst and traffic slowdowns and customer dissatisfaction at best. And when consumers were able to take action on the retail site, it was often only to discover that they'd missed out, and the PS5 pre-orders were already sold out.

Not unique to gaming, but certainly subject to the same laws of supply and demand, as well as the uniquely ardent and persistent nature of passionate gamers, e-commerce retailers, too, need to be on top of game release and pre-release dates as well as prime their platforms to handle anything, any time. Now more than ever, we are living in an e-commerce-first, hands-off, remote world. Retailers understand — or should — that all shopping during the Covid crisis, regardless of how frivolous it might seem, is a connection to normalcy... and this level of e-commerce adoption is here to stay. The bare minimum for ensuring smooth e-commerce site performance should be constantly in mind:

• Deliver performance and speed through the full customer journey, even if the consumer's goal can't be completed

• Be up and available, even if you cannot serve the freshest content.

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Although the aforementioned principles still apply, the marriage of gaming and e-commerce is more than just online shopping through traditional e-commerce platforms, however. E-commerce game platforms, like Steam, exist primarily to buy and play games directly online. Such platforms reveal a willingness to spend significantly on video games, which has now overtaken both the film and digital music industries combined in terms of revenue size[13]. Cloud gaming, essentially, is also a form of e-commerce in that users can subscribe to a cloud-gaming service, such as Microsoft's Xbox Game Pass, Shadow, GeForce Now, PlayStation Now or Google Stadia to gain access to and stream libraries of hundreds of titles, much like Netflix.

Then there's the world of in-game commerce, where players make purchases of items, often virtual, within a game. Free-to-play games are looking for ways to monetize their popularity, and in-game purchases can be lucrative to cash in. With a robust system for

smooth, secure in-game payments, this becomes possible, but that system has to fit seamlessly into games, work well, offer value (personalization, relevance, for example) and not hamper the gaming experience or game performance overall in order to keep players immersed in the game.
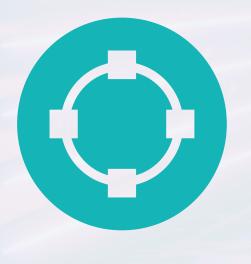

Video games account for **greater revenue** than film and digital music industries **combined**

Sources

[13] retailgazette.co.uk

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CDNs and gaming

The size of game downloads and updates are increasing, and every technical improvement has the potential of making the gaming experience slower. Just the slow pre-gaming experience of downloading and setting up the game for use can take away some of the excitement for the person playing the game.

Content delivery networks (CDNs) are able to help game companies leap over these hurdles by improving speed and performance at download. But traditional commercial CDNs, offering shared resources, can dilute performance and experience for users on big game release days, struggling when new games or updates come out. And for the internet as a whole, for networking engineers, these release events are always on the radar because they strain bandwidth, as the download packages continue to balloon in size. Creating gaming-specific CDNs that meet the specific needs of gaming studios and companies is one way to manage this more efficiently.

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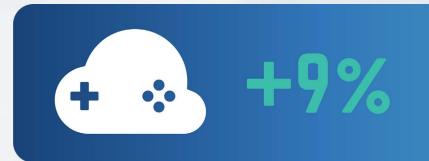
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Mobile and cloud gaming

Mobile and cloud gaming will drive and lead revenue growth as the gaming industry continues to shift away from single-purchase games. While consoles and individual games will continue to be parts of the gaming mix, cloud-based subscription gaming services and microtransactions appear to be the wave of the future.

Mobile gaming has seen a jump in popularity[14] during the pandemic as well, and both mobile and cloud gaming are poised to kickstart a gaming revolution of sorts. Users have already transformed their mobile devices into gaming devices. In fact, almost half of the 3 billion gamers in the world play exclusively on smartphone or mobile devices; this segment is growing faster than all other gaming sectors. As the unexpected popularity of Among Us trended on Twitch, the title also made inroads as a mobile game across the major app stores[15]. It was the top in Q3 2020 on both the iOS App Store and on Google Play, as well as creating a huge spike in Discord's mobile app downloads.

Despite the limitations of, for example, 4G speeds and connectivity, both popularity/name recognition and the uptick in volumes indicate that it won't be a stretch to imagine that the coming of 5G cloud gaming[16] will simply make existing mobile gaming more compelling.

+9% Cloud gaming and subscription services +9% per year

Sources

[14] qz.com

[15] theverge.com

[16] arstechnica.com

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Mobile and cloud gaming

From a performance (and therefore technical) point of view, gaming on mobile devices can be frustrating, but the promise of 5G mmWave technology means a potential for 800MHz individual channel widths that could enable edge data rate throughput of 500Mbps. mmWave also could provide OTA latency of under one millisecond (in ideal conditions, of course).

These figures translate into two real benefits:

• **Throughput:** with higher throughput, your new game downloads or updates are downloaded and open much faster. While this isn't crucial to game play itself, it contributes to the overall experience.

• **Latency:** In gaming, a millisecond is everything. Reducing latency equates to how real time your in-game experience is. That is, accurate placement within the game or movements within the game, e.g. a fighting game where 10ms would render you helpless in the face of an attack you couldn't see coming. Even in games in which latency isn't a deal breaker, reduced latency does contribute to greater consistency in performance.

Meanwhile, cloud gaming, cloud-based gaming, or gaming-as-a-service, as described earlier with regard to game streaming, where games run on servers and are streamed to users, can be a hit-or-miss proposition as well as a source of confusion in terms of how to define it if divorced from game streaming. Requiring considerable processing power, many aspects of cloud gaming can be considered, from a technical point of view, not terribly consequential,

i.e., less effort can go into processing inconsequential factors. But "consistency, fairness, and technical resiliency (i.e.playability)"[17] are defining characteristics of cloud gaming that take precedence over any other aspects of a game and its rendering.

Growing in popularity and stability, game availability has sometimes outstripped performance availability. In many ways, cloud gaming does not stand alone in delivering performance; many different technologies have to work together to deliver gaming content, and this differs depending on how and what the game aims to deliver, who is playing and where they are. What we consider to be "cloud gaming" today could expand to be something different, particularly in the era of 5G when edge cloud nodes will play a key role in facilitating real-time use cases.

Sources

[17] matthewball.vc

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5G (mobile + cloud + edge)

While mobile and cloud gaming don't always go hand in hand, their future is inextricably tied together, largely because 5G technology will bring them together. The opportunity for telcos to tap into the cloud-based video game streaming market, worth an approximate $150 billion USD revenue gain, by launching their own services (possibly alongside charging other companies to use their networks) is, of course, the ultimate goal. Despite the highly competitive nature of the marketplace, telcos such as Deutsche Telekom are dipping their toes in to test the waters, launching cloud-based video game streaming[18] (with an aim to become "the Netflix of video games", which is arguably the aim of most cloud-based game streamers).
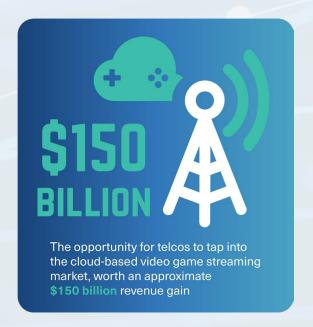
Naturally, existing mobile operators building out their 5G networks will have a competitive edge — literally — because their networks can leverage, or build, decentralized edge cloud nodes to make real-time gaming a reality. Not only will this be an avenue to compete with the Google Stadias and other tech companies game streaming

services, it will also provide a competitive edge in the network itself. By leveraging low-latency edge architecture and moving the action closer to the edge of the network, as close as possible to the end user, latency becomes a thing of the past. The gains in throughput, speed and reliability create a new edge-cloud gaming paradigm via 5G, wherein connections could be measured by the reliability of their 1ms latency instead of their 1Gbit/s connectivity[19]. The low-latency thresholds also enable other possibilities, such as with e-sports and live e-sports tournaments and sports betting, and other similar use cases with no tolerance for performance lag.

$150 BILLION

The opportunity for telcos to tap into the cloud-based video game streaming market, worth an approximate **$150 billion** revenue gain

For telcos, it's a matter of jumping on the opportunity and being ready for the coming wave of game streaming and online, real-time, interactive play. But 5G can benefit everyone in the gaming ecosystem — players most of all.

Sources

[18] lightreading.com

[19] lightreading.com

CONSIDERATIONS:
Moving pieces on the game board

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While the complexity of the gaming universe adds up to a lot of moving parts that make it work, there are a number of essential parts Varnish Software can help with, whether you're a telco operator, an ISP, a CDN provider, an e-commerce or in-game payment platform or another part of the mercurial and expanding gaming ecosystem:

- performance: throughput, speed and latency reduction are key at every scale

- access to no to low-latency TTFB for real-time use cases/interactivity

- caching of increasing amounts of dynamic content — especially at the edge as a key enabler in the deployment of flexible edge cloud nodes

- more capacity, resilience and concurrency with the bandwidth available to enable massive multiplayer experiences and even the ability to download the same huge files all at once without overloading the origin

- future-proof capabilities, with the introduction of 5G-ready and 5G networks, edge caching and edge cloud CDNs and use cases like VR and blockchain gaming as well as green sustainability boosts from leveraging 5G

TAMING GAMING:
The game changes but never ends

With Varnish and its flexible, high-performance content delivery solutions, you have a partner who can work together with you to develop your game delivery offer while creating new revenue generating possibilities and keeping your gaming customers happy.

Get in touch to discuss your shift in gaming plans.

email: info@varnish-software.com

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