



Enabling Secure, Fast, and Immersive Gaming Experiences

**Common Challenges & Winning Solutions for
Game Developers**

PART 1

Cybersecurity: Beating hackers at their own game



Game development is an intricate, time-consuming process, and the work doesn't stop after a title is released. To keep players engaged, game companies must continually push out new, cutting-edge features and ensure nothing less than world-class performance and 100% uptime, all while ensuring that cyber attacks don't compromise game integrity or the user experience.

Traditionally, game platforms have prioritized user experience over cybersecurity, fearing that robust security and authentication measures, such as SSL/TLS, would increase latency and cause user attrition. However, as gaming grew into the world's most popular and lucrative form of entertainment,¹ hackers began heavily targeting the industry, negatively impacting game performance and integrity.



Defending against DDoS attacks

DDoS attacks have long plagued online games. Over the Christmas holidays in 2013, hacker Austin Thompson launched a series of DDoS attacks against popular gaming sites, including Steam, PlayStation Network, Microsoft Xbox, Riot Games, and League of Legends.² Thompson's antics inspired throngs of copycats; end-of-year DDoS attacks on online gaming platforms became so common that days before Christmas 2018, the FBI, in partnership with UK and Netherlands law enforcement agencies, preemptively seized 15 domains belonging to DDoS-for-hire services.³

Unfortunately, this virtual raid didn't quell the growth of denial of service attacks. Kaspersky found an **18% year-over-year increase in DDoS attacks during Q2 2019, and a 32% increase in application-layer attacks**,⁴ a highly sophisticated form of DDoS attack that utilizes malicious bots to attack specific applications.

Blocking DDoS attacks requires an automated, layered security approach such as the one employed by [Cloudflare's DDoS protection service](#), which prevents disruptions caused by malicious traffic while allowing legitimate traffic through, ensuring that end-users' experience is not impacted.

Attackers can also directly send volumetric DDoS traffic to the custom TCP and UDP communication protocols that many game platforms rely on; they can also use these ports to intercept unencrypted data in transit. Game developers need additional resources to defend these ports and protocols without compromising performance. For example, [Cloudflare Spectrum](#) extends the power of Cloudflare's DDoS, TLS, and IP Firewall to TCP and UDP-based services, protecting custom gaming protocols from layers 3 and 4 DDoS attacks and enabling TLS/SSL protection to encrypt customer data.

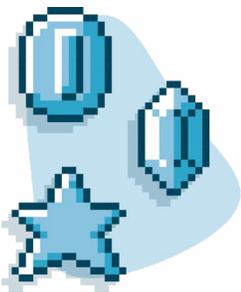
Attackers utilize malicious bots to launch DDoS attacks, hijack player accounts, steal virtual assets, damage the integrity of FPS, eSports, and world simulation games, and severely undermine the user experience.

Credential stuffing

Game platforms, which attract a young demographic that is prone to reusing passwords,⁵ are ideal targets for credential stuffing attacks. Hackers buy extensive lists of compromised credentials harvested from major data breaches, then deploy bots that attempt to use them on multiple websites. Popular video game distribution platform Steam estimates that every month, approximately 77,000 of its gamer accounts are hacked.⁶

Armed with stolen credentials, hackers can clean out accounts of in-game coins, skins, and other digital assets, or lock the real owner out and resell the account.

Stolen credentials from Fortnite, Minecraft, and RuneScape can net up to USD \$40 per set.⁷



Gold farming & powerleveling

Taking over legitimate accounts isn't the only way attackers can steal virtual assets. In "gold farming" and "powerleveling," attackers program bots to play continuously and amass virtual items for the purpose of resale. These bots consume game resources and degrade performance, alienate legitimate players, promote user attrition, and cost game publishers up to 40% of their in-game monthly revenues.⁸

Automated bot management solutions use machine learning and behavioral analysis techniques to detect and block malicious bots while letting through legitimate bots, such as those used by search engines. Select a solution that is comprehensive but that does not require complex configuration or maintenance, such as [Cloudflare Bot Management](#), so that you can focus on building games instead of managing bots.

PART 2

Accelerating your game





Latency, latency, latency

Just as success in real estate is about location, location, location, winning in the gaming industry is about latency, latency, latency.

No other app may be as sensitive to latency as a game. Visitors to a news site may be willing to wait a few seconds for an article or a video to load. A delay that long within a game is completely unacceptable. In an FPS game, the window in which

players can successfully execute an action is measured in thousandths of a second. Even in turn-based and world-simulation games, players expect a real-world, real-time feel. **Game elements must respond instantaneously when clicked, and videos in eSports games must load immediately and play seamlessly.**

Because so many factors impact how quickly web assets load, ensuring low latency is a perennial challenge. Among many variables, latency is impacted by:



Geographic distance It's estimated that every 100 miles of geographic distance between an app or website's resources and an end-user adds 0.82 milliseconds of latency.⁹ This is a particularly vexing problem in gaming because the industry serves a global customer base.



Game complexity Game sizes were once constrained by the size of physical delivery mediums such as CD-ROM discs. Thanks to widespread high-speed internet access, today's games are limited only by end-user bandwidth and hard drive space, and today's gamers expect to be immersed in intricate virtual worlds. The high-res videos, 5.1 surround sound audio, and intricate textures used to create these worlds have caused game sizes to balloon. In the mid-2000s, Red Orchestra 1 was considered quite large at 2.6GB. Forza Motorsport 7, released in 2017, is a whopping 96.5GB.¹⁰



Mobile users Mobile gaming, valued at \$55 billion in 2018, has already surpassed the console and PC markets and is expected to surpass USD \$100 billion by 2022.¹¹ Building games for mobile presents a unique set of challenges. Mobile performance is constrained by network connectivity and availability. Despite the widespread availability of 4G and 5G networks in some countries, 60% of mobile connections worldwide are over 2G.¹² In some regions, mobile network providers will throttle bandwidth past a certain amount.¹³



Slow DNS resolution When users access games, their devices must query a DNS resolver that will map the game's domain name to its IP address, then send the correct IP address back to the device. This is called DNS resolution, and optimizing it is an important part of optimizing performance. Not all DNS providers are optimized for speed; many DNS providers take over 50 milliseconds to resolve each DNS query. The fastest DNS providers will resolve queries in under 20 milliseconds; Cloudflare DNS, for example, resolves queries in under 12 milliseconds on average.¹⁴



Unevenly distributed server workloads Over-utilized servers run more slowly, increasing latency. To maximize performance, workloads must be distributed evenly among a network of servers. Effective load balancing can significantly improve performance; one SaaS company experienced a 2-3 second improvement in page load times after deploying [Cloudflare Load Balancing](#).¹⁵



Server crashes Like all computers, servers sometimes crash. Without a failover plan, server crashes can result in poor performance or downtime. Online gaming has no off-seasons or off-hours during which games can be partially or completely offline. Gamers play 24 hours a day, 365 days a year, and anything less than 100% uptime will cause them to abandon the game.

Many latency and download time problems can be solved with a robust content delivery network (CDN), which caches static content at the network edge so that it can be delivered from a server located nearest the end-user. This greatly enhances performance and minimizes bandwidth consumption by reducing the number of requests sent to the origin server.

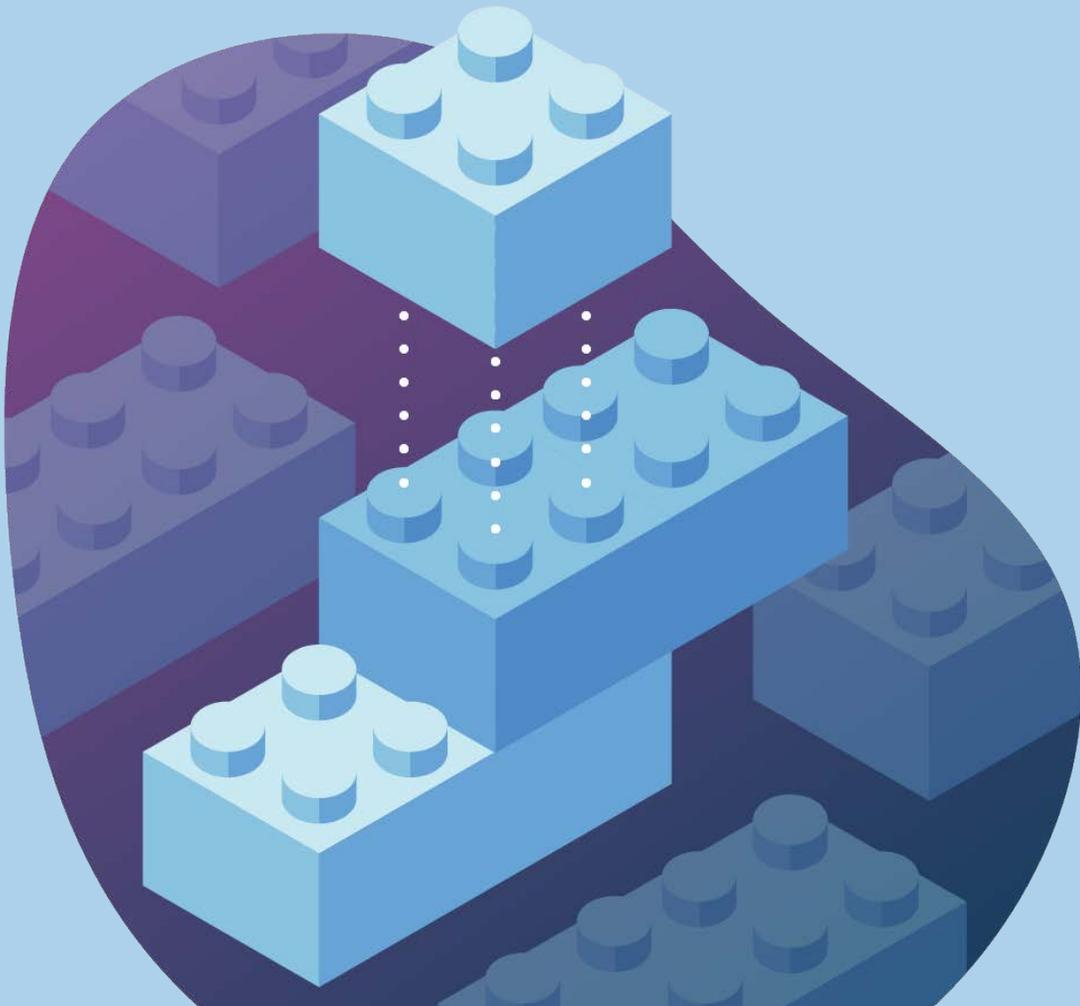
In-browser gaming company CrazyGames saved over 40TB of bandwidth every month and improved site performance after switching to [Cloudflare CDN](#).¹⁶

In addition to using a CDN for static content optimization, game platforms must also optimize dynamic content by deploying dynamic routing protocols, which analyze real-time network conditions to serve content over the fastest available links. Because dynamic routing is highly complex to configure and maintain, most gaming companies use an automated solution such as [Cloudflare Argo Smart Routing](#). After deploying Argo in tandem with Cloudflare CDN, gamer chat app Discord cut load times by an average of 33 milliseconds.¹⁷

Game developers should ensure that their CDN provider supports [the latest web standards](#) and protocols, including HTTP/2 and QUIC (HTTP/3), which allow for faster application layer data transmission, and TLS 1.3, which ensures more efficient SSL encryption.

PART 3

Building apps: Staying in the game without breaking the bank



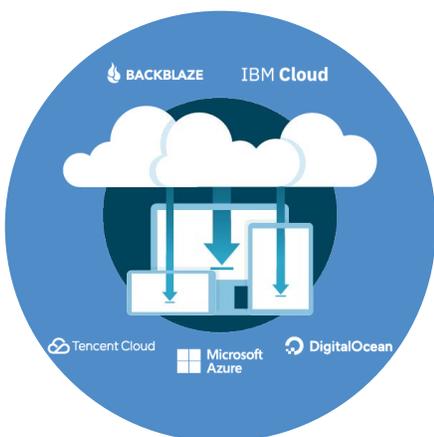
In 2018, the video games market was valued at over USD \$130 billion and is projected to exceed USD \$300 billion by 2025.¹⁸ Games are the most lucrative type of mobile app, but the market is getting increasingly crowded; even big names like Snapchat and Facebook Messenger are trying to cash in on the mobile gaming craze.¹⁹ Next on the horizon is cloud-based game streaming fueled by the growth of 5G networks, which promise high bandwidth and low latency on mobile.²⁰

In this dynamic, incredibly competitive market, game development companies, most of which are small businesses, are under intense pressure to develop and release quality products as soon as possible while keeping their internal expenses low. These small developers must focus on developing, building, and enhancing games; they simply cannot afford to get bogged down in underlying infrastructure management, such as configuring servers.

Migrating to infrastructure-as-a-service (IaaS) platforms, such as AWS, Azure, and Google Cloud Platform, allows game companies to replace capital expenditures on hardware with lower operational expenditures. Developers can also take advantage of the flexibility and scalability benefits of the cloud.

However, for all the promises of the cloud, it's not a panacea. Developers must wrestle with virtual machines, containers, or both. Serverless computing options, such as [Cloudflare Workers](#), enable developers to augment existing applications or create entirely new ones without configuring or maintaining VMs, containers, or other cloud infrastructure. Cloudflare Workers lets developers deploy serverless JavaScript applications on Cloudflare's global cloud network, where they are seamlessly scalable and closer to end users.

In tests comparing Cloudflare Workers against AWS Lambda and Lambda@Edge, Workers proved to be 441% faster than a Lambda function and 192% faster than Lambda@Edge.²¹



Cloud service bills can also quickly get out of hand because of “egress” fees. Also known as data transfer or bandwidth fees, egress fees are charged when stored data is transferred to customers. Because game platforms are transferring enormous amounts of data to players, 24 hours a day, every day, these fees are responsible for the bulk of a typical gaming company’s cloud service bill.

To solve the problem of eye-popping egress fees, Cloudflare founded the [Bandwidth Alliance](#). Most cloud providers that deliver traffic to users via Cloudflare share a presence with Cloudflare in the same data centers around the world. In these data centers, traffic is transferred locally through a peering connection, minimizing infrastructure costs and transit charges.

Members of the Bandwidth Alliance pass on these cost savings by greatly reducing data transfer charges or waiving them altogether when data is transferred between Alliance members, which include big names such as Microsoft Azure and IBM Cloud. Multiplayer cloud platform Nodecraft significantly cut its egress fees after migrating 23TB from Amazon to Backblaze, a member of the Bandwidth Alliance.²²

Conclusion

Game companies are tasked with rapidly pushing new titles and features to market while simultaneously keeping internal costs low, fending off relentless cyber attacks, and satisfying the exacting performance expectations of one of the world's most demanding customer bases. Automating underlying infrastructure tasks and security functions with services such as [Cloudflare's Solutions for Gaming](#) enhances performance and security, reduces time to market, minimizes expenses, and frees up developers to focus on their core competency: building games.

About Cloudflare

Cloudflare, Inc. (www.cloudflare.com / @cloudflare) is on a mission to help build a better Internet. Today the company runs one of the world's largest networks, with nearly 10 percent of the Fortune 1,000 companies using at least one Cloudflare product. Cloudflare's platform protects and accelerates any Internet application online without adding hardware, installing software, or changing a line of code. Internet properties powered by Cloudflare have all web traffic routed through its intelligent global network, which gets smarter with every request. As a result, they see significant improvement in performance and a decrease in spam and other attacks. Cloudflare was named to Entrepreneur Magazine's Top Company Cultures 2018 list and ranked among the World's Most Innovative Companies by Fast Company in 2019. Headquartered in San Francisco, CA, Cloudflare has offices in Austin, TX, Champaign, IL, New York, NY, San Jose, CA, Washington, D.C., London, Munich, Beijing, Singapore, and Sydney.

Endnotes

1. D'Argenio, Angelo M. "Statistically, Video Games Are Now the Most Popular and Profitable Form of Entertainment." <https://www.gamecrate.com/statistically-video-games-are-now-most-popular-and-profitable-form-entertainment/20087>. GameCrate. Accessed 27 August 2019.
2. Cimpanu, Catalin. "Hacker who launched DDoS attacks on Sony, EA, and Steam gets 27 months in prison." <https://www.zdnet.com/article/hacker-who-launched-ddos-attacks-on-sony-ea-and-steam-gets-27-months-in-prison/>. ZDNet. Accessed 27 August 2019.
3. Cimpanu, Catalin. "Law enforcement shut down DDoS booters ahead of annual Christmas DDoS attacks." <https://www.zdnet.com/article/law-enforcement-shut-down-ddos-booters-ahead-of-annual-christmas-ddos-attacks/>. ZDNet. Accessed 27 August 2019.
4. Ahaskar, Abhijit. "DDoS attacks rise by 18% since last year, longest attacks lasted 509 hours: Kaspersky." <https://www.livemint.com/technology/tech-news/ddos-attacks-rise-by-18-since-last-year-longest-attacks-last-ed-509-hours-1565095050443.html>. LiveMint. Accessed 26 August 2019.
5. "Online Security Survey - Google/Harris Poll." http://services.google.com/fh/files/blogs/google_security_infographic.pdf. Accessed 27 August 2019.
6. "Security & Trading." <https://store.steampowered.com/news/19618/>. Steam. Accessed 27 August 2019.
7. Spring, Tom. "Gamers Are Easy Prey for Credential Thieves." <https://threatpost.com/gamers-are-easy-prey-for-credential-thieves/146700/>. ThreatPost. Accessed 27 August 2019.
8. Cook, Matthew. "Why Online Video Gaming Will Be The Next Industry Under Cyber Attack." <https://www.darkreading.com/vulnerabilities---threats/why-online-video-gaming-will-be-the-next-industry-under-cyber-attack-/a/d-id/1325519>. DarkReading. Accessed 27 August 2019.
9. Sherman, Fraser. "Network Latency Milliseconds Per Mile," Techwalla, <https://www.techwalla.com/articles/network-latency-milliseconds-per-mile>. Accessed 6 August 2019.
10. Wilde, Tyler. "How game sizes got so huge, and why they'll get even bigger." <https://www.pcgamer.com/how-game-sizes-got-so-huge-and-why-theyll-get-even-bigger/>. PCGamer. Accessed 27 August 2019.
11. "Video Games - Thematic Research." <https://www.globaldata.com/store/report/gdtmt-tr-s212--video-games-thematic-research/>. GlobalData. Accessed 27 August 2019.
12. Schwarz, Ben. "Beyond the Bubble: Real world performance." Calibre (Medium), <https://building>.
13. O'Donoghue, Ruadhán. "You've been throttled, but don't stop browsing!" mobiForge, <https://mobiforge>.
14. "DNS Performance Analytics and Comparison." DNSPerf, <https://www.dnsperf.com/>. Accessed 23 July 2019.

15. "Cloudflare Case Study: Crisp." Cloudflare, <https://www.cloudflare.com/case-studies/crisp/>. Accessed 26 July 2019.
16. "Cloudflare Case Study: CrazyGames." Cloudflare. <https://www.cloudflare.com/case-studies/crazygames/>. Accessed 28 August 2019.
17. "Cloudflare Argo Smart Routing." Cloudflare. <https://www.cloudflare.com/products/argo-smart-routing/>. Accessed 28 August 2019.
18. "Video Games - Thematic Research." <https://www.globaldata.com/store/report/gdtmt-tr-s212--video-games-thematic-research/>. GlobalData. Accessed 27 August 2019.
19. Webster, Andrew. "Snap's big plan to turn Snapchat into a gaming platform." <https://www.theverge.com/2019/5/1/18525168/snapchat-games-bitmoji-party-developers>. The Verge. Accessed 27 August 2019.
20. Huawei. "Industries + 5G: 5G Transforms the Gaming Industry and Facilitates Cloud Gaming." <http://telecoms.com/intelligence/industries-5g-5g-transforms-the-gaming-industry-and-facilitates-cloud-gaming/>. Telecoms.com. Accessed 27 August 2019.
21. Bloom, Zack. "Serverless Performance: Cloudflare Workers, Lambda and Lambda@Edge." <https://blog.cloudflare.com/serverless-performance-comparison-workers-lambda/>. Cloudflare. Accessed 28 August 2019.
22. "Nodecraft Switches Cloud Providers to Save Big With Bandwidth Alliance." Cloudflare. <https://www.cloudflare.com/case-studies/nodecraft-bandwidth-alliance/>. Accessed 28 August 2019.



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