Cloudflare Workers for Gaming

Approach
Currently, AAA game publishers like EA, Activision-Blizzard and Riot don't use any kind of Cloudflare product to improve their gaming traffic. This report details a basic glance at how the Cloudflare Workers (CFW) could approach building a product that is attractive enough to lure those publishers onto Cloudflare's content delivery network (CDN).

For most of my research I've used League of Legends publisher **Riot Gaming** as a proxy for the entire gaming industry because they're the largest game developer that I already have some understanding of. Additionally, they have well documented architecture https://technology.riotgames.com/news/architecture-league-client-update, and community that posts frequently about the company's network.

means further research is needed for other AAA game developers, as well as indie developers

Interesting Fields of Expansion for Game Developers

Distributed Bespoke Game Servers
Riot currently uses a private content delivery network (CDN) for their games, which uses one server for each of their "regions", like North America, Asia Pacific, Europe, etc. In all of North America, Riot's only game server is in Chicago, which means pings of 70ms+ on the West Coast, and upwards of 300ms for anyone playing overseas.
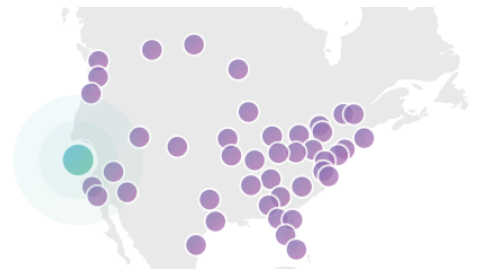
Cloudflare's server locations across the US

Cloudflare has a ton of servers spread across the country, which could be used to improve the latency experienced by gamers who live far from the server.

Cloud Computing (NVidia GeForce)
Non-gaming personal computers often struggle with RAM when running games like League of Legends. For other games with more updated graphics, the processing power that goes into rendering these graphics is often incredibly expensive for older computers. A solution that Nvidia has adopted is to have the graphics and rendering processes run on their cloud servers, and allowing users to simply stream the video feed to their computers.

This is a relatively new market, and Cloudflare could potentially address it, but one of the major drawbacks in my mind is that Nvidia has already cornered this market aggressively, and the kind of dedicated gamer who might need this service likely have their own custom gaming PCs.

Proposed Product Innovation:

I chose to tackle the former problem, and get game developers to distribute their servers across Cloudflare's CDN to improve latency. Currently, Cloudflare's CDN is optimized for HTTP/TCP calls to web-servers, and it's really good at improving the latency on these fairly slow protocols. However, game developers don't use HTTP calls, but instead send custom calls to private game servers with their own architecture; what works for Riot wouldn't necessarily work for Activision-Blizzard, and vice versa. These calls are typically measured in bytes rather than kilobytes.

Custom calling protocols + endpoints for bespoke servers in CFW

To account for this, CFW needs to create a streamlined way to customize non-HTTP server calls and add an endpoint that can interface with the existing bespoke gaming servers which Riot and other developers currently use.

Once this system has proven its ability to reduce latency by hosting games on servers closer to the players, further features can be developed on top of this platform. However, until AAA game developers are actively using the Cloudflare's CDN instead of their own, further gaming-focused product improvements are unlikely to attract a meaningful number of developers.

Risks & Concerns

Locality of Match-Making: Currently, having the game hosted on a single highly dedicated server allows for better long distance communication at the expense of longer distances. Using local Cloudflare servers, we would reduce the latency for players playing who are closer together, but increase latency for long distance games.
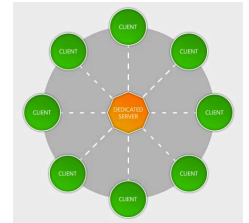
Hardware Incompatibility: Also, it's possible that this migration from the custom server is logistically impossible, because the hardwire that Riot's servers uses might be incompatible with CF server hardware, or integrate so poorly that the latency loss is actually worse than the status quo.

Bandwidth Limitations: Web-server calls are slow but contain much more information, the CF network which is optimized for that might be poorly configured to support fast and tiny custom calls to gaming severs (think several race cars and a few trucks driving on the same road).

Goals & KPI
The initial goal of this phase of the vertical would be to effectively move AAA game developer's dedicated servers onto the cloud, which would enable people to play without the large latency gaps these dedicated servers create due to their scarcity. This would then incentivize all game developers to move their CDN onto Cloudflare's network.

Important KPI that we would want to monitor the before and after changes in are:
- Ping of users who live far from the dedicated server
- Ping of users who live close to the dedicated server
- Ping in games that are hosted between players who are geographically closer to each other
- Distribution of lag spikes; lower median latency at the expense of more lag spikes is poor performance
- Impact of performance for other users of the Cloudflare services after this product is rolled out
- Cost of hosting this additional traffic / profitability of this traffic
- The ease with which AAA game developers rate their use of the new CFW functionality
- **Most importantly: the rate of acquisition of game developers and publishers as customers**

Rollout / Testing process
- V 0.1: Create very basic custom calling protocol builder in CFW
- V 0.2: Create simple end point for connection with private Riot dedicated servers, invite Riot software architects for feed back and improvement
- V 0.3: Create alpha testing system in connected to one of Riot's new releases (Legends of Runeterra which is less punishing when latency is poor)
- V 0.3.2: monitor performance of CF hosted games against Riot's dedicated server's performance, tweak and improve until performance is on par
- V 0.4: Test game latency for cross country games hosted on CF
- V 0.5: Launch beta with Riot's new game, market towards users previously gated by poor internet access
- V 0.6: Invite other game publishers like Wargaming, Epic, etc. to build with the custom protocol on CFW
- V 0.7: Release sandbox mode for all AAA game developers, follow similar lifecycle as with Riot previous games, focus on low latency genres like Real Time Strategy initially because they're less punishing
- V 0.8: Develop services for indie gaming platforms
- V 1.0 Launch!