Technical Validation

Google Cloud for Gaming: Scalable, Secure, Reliable Infrastructure

Google Kubernetes Engine, Game Servers, and More

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ESG Technical Validations

The goal of ESG Technical Validations is to educate IT professionals about information technology solutions for companies of all types and sizes. ESG Technical Validations are not meant to replace the evaluation process that should be conducted before making purchasing decisions, but rather to provide insight into these emerging technologies. Our objectives are to explore some of the more valuable features and functions of IT solutions, show how they can be used to solve real customer problems, and identify any areas needing improvement. The ESG Validation Team's expert third-party perspective is based on our own hands-on testing as well as on interviews with customers who use these products in production environments.

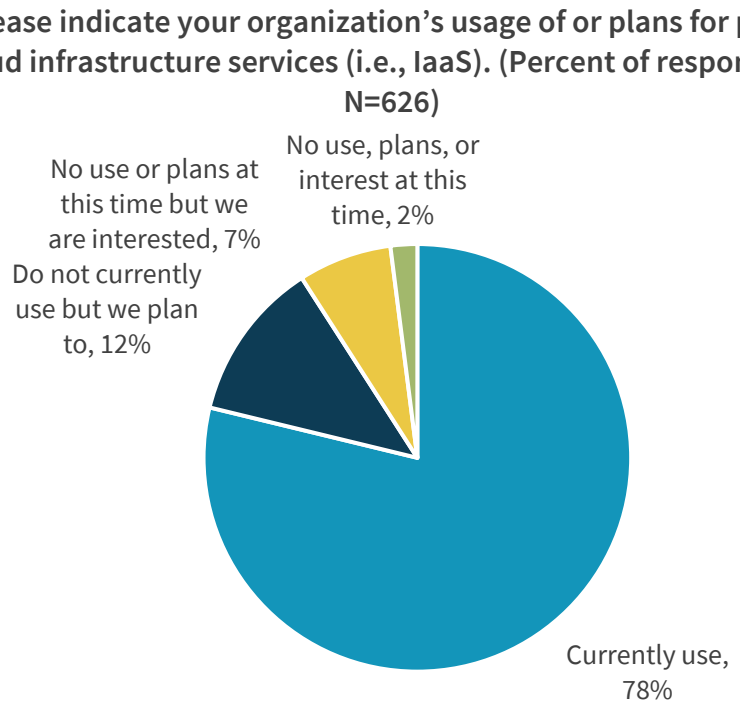
Introduction

This ESG Technical Validation documents ESG's review of Google solutions for the gaming industry, including Google Cloud and Google Kubernetes Engine (GKE). The report focuses on real-world proof points including an impressive scale demonstration and real customer successes.

Background

The challenges of managing infrastructure have driven many organizations to use public cloud infrastructure-as-a-service (IaaS). While it was initially used for development, today organizations are running business-driving, production applications on IaaS. The benefits are significant, as organizations can offload everyday operations, including scaling, data protection, patching, upgrades, and maintenance, freeing up IT staff for other tasks. According to recent ESG research, 90% of respondents currently use or plan to use IaaS, with 78% currently using it and 12% planning to use it. IaaS usage has grown every year over the past decade, with growth almost doubling since 2017 (42% - 78%).[1]

Figure 1. Current Usage of Public Cloud IaaS



Source: Enterprise Strategy Group

Gaming is Gigantic

Video gaming is a huge industry across the globe. By some estimates there are more than 2 billion gamers, representing a quarter of the world's population.[2] They are playing mobile games, console games, online games, and virtual reality games offering action, adventure, role-playing, simulation, strategy, sports, puzzles. . . in fact, almost anything you can think of can be incorporated into a game. Games can be single or multiplayer, local or global, with features that include the ability to "level up," purchase new "lives," collect and use objects, communicate with other players, compare scores, and

[1] Source: ESG Master Survey Results, *2021 Technology Spending Intentions Survey*, December 2020.
[2] Source: Wired, *An Infrastructure Arms Race Is Fueling the Future of Gaming*, June 2020.

broadcast the experience. Game developers are constantly innovating to increase the number of players, expand the experience, and monetize player activities.

Gaming Infrastructure Challenges

A key challenge in game delivery is building and maintaining the infrastructure—servers, storage, networks, security—to deliver the optimal experience and ensure the level of performance that players demand. Many game companies leverage containers and microservices architectures orchestrated with Kubernetes. This deployment has numerous advantages: it speeds start up and scaling; increases portability; improves security by isolating applications; increases resource efficiency; and enables faster enhancements with continuous integration/continuous development (CD/CD). But building this kind of infrastructure requires IT expertise, which game developers often lack. Challenges include:

- *Scale and Spikes*. Numbers of users change at launch, as features are added, and as users come and go. When a game is initially launched, game hosters have no idea how many players will join; the latest hot game may add a million users in a day. To support that, organizations must have the ability to ramp up quickly and maintain performance. This includes compute power (usually in virtual machines (VMs) running in clusters), network connectivity, database activity, and data centers located near enough to users to avoid latency issues. Games typically experience peaks and troughs of usage, which require the ability to scale up and then back again for cost efficiency. Managing this variable scale is a huge challenge for those running their own data centers.

- *Manageability*. One of the biggest challenges game companies experience is having sufficient IT staff around the world to operate the infrastructure on a daily basis. Managing large Kubernetes clusters takes significant time and effort. In addition to scaling for peaks and troughs, they must keep hardware and software patched and up to date at all times; handle node/component failures; and implement log acceleration, network policies, and health checks. A critical management challenge is keeping the entire system secure, as cyber-attacks are constantly on the horizon.

- *Reliability*. Gamers have little tolerance for downtime or disruption, so hosting platforms must be completely reliable and IT managers must be able to perform maintenance and updates without interrupting play. Games may transmit packets 100 times per second between the player and the server; networks that drop or delay packets disrupt play. Even minor problems with response times can cause players to leave the game, damaging revenue opportunities. IT must be able to maintain reliability at all costs, including scaling VMs, updating network switches, expanding databases, and adding points of presence (PoPs) without disrupting play.

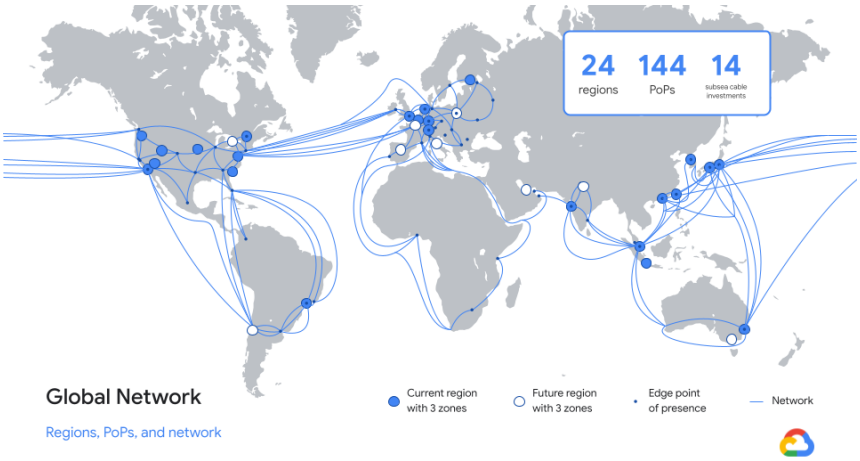
- *Databases and machine learning (ML)*. Databases are needed to capture player rankings and inventory updates, and to monetize in-game activities. The ability for players to purchase additional "lives" or tools makes games more engaging and increases revenue. To handle this, many games run hundreds of instances of commodity databases; this is difficult to scale globally, and increases demands on IT staff. To get the most out of these player activities, game companies need to mine the data they collect; training models with machine learning tools enables them to make money faster. Managing database instances across the globe to deliver these insights adds cost and complexity.

Google Cloud for Gaming: Scalable, Reliable, and Secure

The key benefit of Google for gaming is that it can provide a high-performance, high-quality gaming infrastructure as a managed service, relieving game companies of building, managing, operating, and supporting it on their own. This

simplification reduces the total cost of infrastructure and can mean the difference between success and failure. It lets game companies focus on what they do best—creating enticing game experiences.

While Google's public cloud offers a range of products that can support specific gaming processes, our focus is on the fully managed, secure infrastructure with massive scalability and complete reliability. There are numerous Google Cloud solutions that provide a robust and complete gaming environment, including game servers, fast network capabilities, databases, and Kubernetes container orchestration; several are mentioned below.

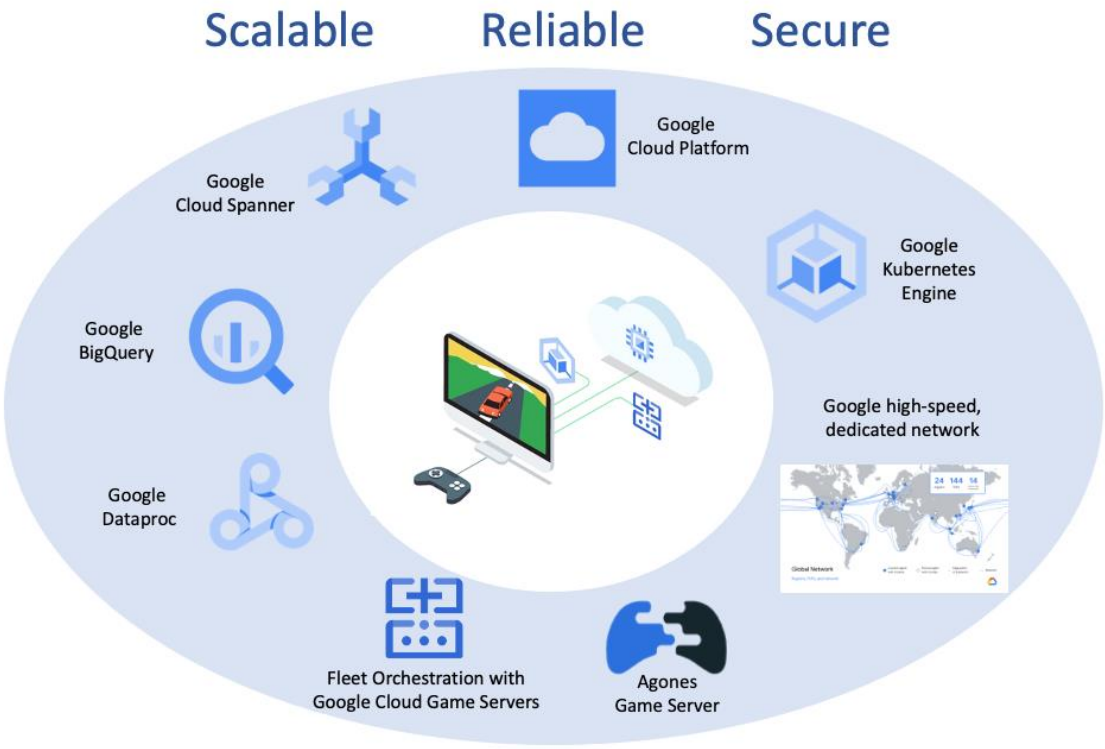


- *Google Cloud*. The Google Cloud ecosystem includes globally distributed regions connected by Google's dedicated, high-speed, fiber-optic network. There are currently 24 regions and 144 points of presence that deliver low latency, with additional PoPs in process. Different compute instances can be used for cost efficiency, such as less costly VMs for casual mobile games, and high-clock-speed servers for battle royale games.
- *Google Kubernetes Engine*. This secure, managed container platform lets game companies place their gaming infrastructures wherever they need for a low latency experience. GKE provides containerized solutions with prebuilt deployment templates and supports massive scaling, including thousands of containers, nodes, and pods on a single cluster. The GKE platform fully manages the control plane, handling numerous server tasks such as cluster management across time zones and CI/CD pipeline code creation for game servers around the world. Organizations can take advantage of GKE capabilities in on-premises data centers or wherever they are needed using Anthos, a managed application platform. Anthos extends Google Cloud services and engineering practices so organizations can modernize apps faster and maintain operational consistency. Features of GKE include:
    - Horizontal and vertical autoscaling of pods and clusters based on CPU and memory needs.
    - Node pools, groups of similarly configured nodes that are managed and scaled as independent groups.
    - Automatic repairs and upgrades.
    - Two operational modes:
        - Autopilot mode. Google provisions and manages the underlying cluster infrastructure, including nodes and node pools. Clusters are pre-configured with GKE best practices using customer workload-defined resource requirements. Autopilot lets customers use Kubernetes without having to manage infrastructure, control plane, or nodes; it can reduce the operational load while ensuring high performance, security, and resilience.
        - Standard mode. Customers manage their cluster's underlying infrastructure, providing node configuration flexibility. This option is for customers that want to customize cluster configurations or manually provision/manage node infrastructure.
    - Choice of release channels to match the preferred update cadence for stability.

- Security features, including encryption and vulnerability scanning, support for Kubernetes Network Policy traffic restrictions, and private cluster support.
- Integrated cloud monitoring and logging.
  - For both Autopilot and standard modes, GKE nodes are pre-configured with agents that automatically collect system logs and metrics. Organizations can monitor the health of gaming resources by defining SLIs and SLOs and explore logs to troubleshoot, define proactive alerts for individual and aggregated player experiences, and provide actionable data for operations such as autobanning at scale.
- Support from Google Site Reliability Engineers.

- *Agones* and *Google Cloud Game Servers (GCGS)* game hosting tools, which let game companies automate fleets of game servers, schedule scaling events, and monitor fleet health.
  - Agones is a dedicated, open-source game server, designed to run multi-player game servers on top of Kubernetes clusters. It provides the ability to tailor servers to the needs of your games.
  - GCGS is an open-source, fleet-orchestration management layer on top of Agones and Kubernetes that powers global, multi-cluster game server workloads. It provides visibility for running, scaling, and orchestrating game servers and monitoring their health, whether the clusters are running on GKE, bare metal, or a combination. Organizations may choose GCGS or continue to manage via direct access to Kubernetes clusters. GCGS provides:
    - Automatic scaling as needed according to custom game policies.
    - Easy management of multiple versions of game server code.
    - Simple deployment and a central control plane for Agones installation.
    - Access to Kubernetes and Agones APIs to tailor game servers as you need.
    - Full Google Cloud support.

Figure 2. Key Google Cloud Resources for Gaming



Source: Enterprise Strategy Group

- *Google BigQuery*, a scalable, serverless cloud data warehouse that speeds large-scale data analytics. BigQuery and its built-in machine learning help game companies gain insights to increase revenue by analyzing user activities, regardless of whether they are running their games on GKE or bare metal. Security and reliability are built-in to ensure high availability. Gaining analytics insight without having to do day-to-day infrastructure management is a significant benefit. (According to Google, one well-known game seamlessly ingests more than 70 billion events per day to BigQuery, with Google managing all the operations.)

- *Google Dataproc* offers customers Apache Spark on GKE to accelerate their Spark streaming, batch, and data analytics jobs for in-game offers and recommendations. Spark on GKE provides a resource management upgrade beyond the traditional YARN-based tooling. This helps isolate Spark code and version dependencies so companies can quickly build, improve, and deploy new pipelines and analytics.

- *Google Cloud Spanner*, a fully managed, horizontally scalable, highly available relational database. Game deployments benefit from Spanner's ease of management, high performance across regions, single-instance deployment, and automatic scalability. Spanner never needs to be paused for patches, backups, failover, or even schema updates. Using Google's dedicated infrastructure, Spanner guarantees consistency and zero planned downtime, even at the most extreme scale, which results in better game play and satisfied customers. Spanner is a globally distributed, ACID-compliant database that automatically handles replicas, sharding, and transaction processing, so customers can quickly scale to meet any surge in game demand, even when users grow from zero to millions in a few hours.

ESG Technical Validation

ESG reviewed a demonstration of how easy it is to set up and deploy a worldwide game with a Google gaming infrastructure that automatically scales.

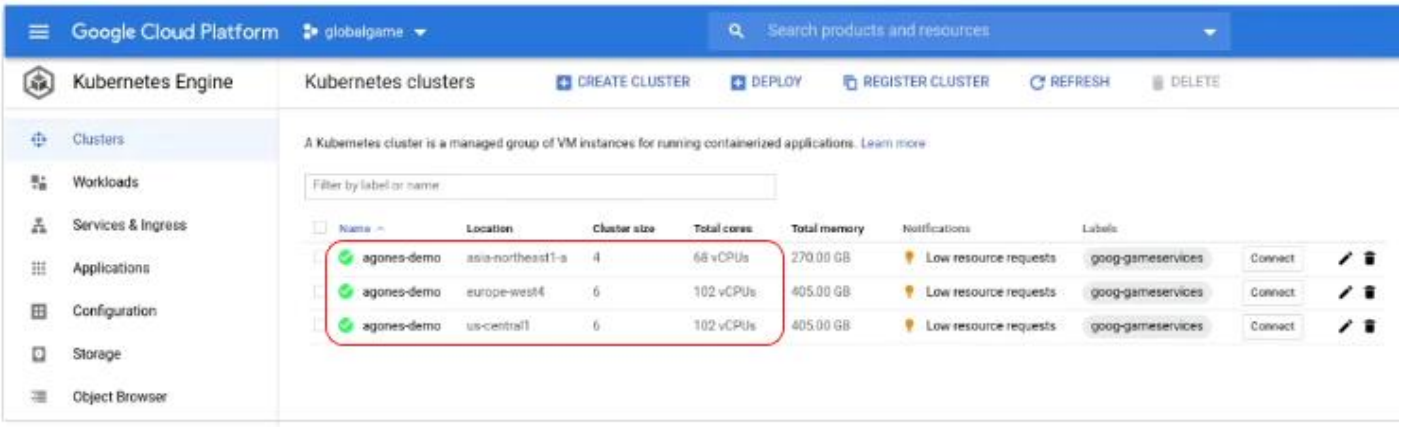
Global Deployment and Scale to 1M Players in Less than 10 Minutes

To power a global game, several components are required: A global, high-performance network to connect users with the game and with each other; high-performance compute to run simulations and multi-player matches; global database instances to track player progress; planet-scale analytics to absorb continual events and help monetize them; and fleet orchestration to optimize the number of nodes as players join and leave.

ESG Testing

ESG viewed a demonstration of setting up a game with Google Cloud and scaling resources to support one million users, using GKE, Agones, GCGS, BigQuery, and Spanner. This began with creating three clusters in the US, the Netherlands, and Japan and installing Agones. Figure 3 shows six-node clusters in the Netherlands (europe-west 4 region) and the US (us-central1 region) with 102 vCPUs and 405 GB of memory, and a four-node cluster in Japan (asia-northeast1-a) with 68 vCPUs and 270 GB of memory. These pods were running Agones and nothing else.

Figure 3. Create GKE Clusters



Source: Enterprise Strategy Group

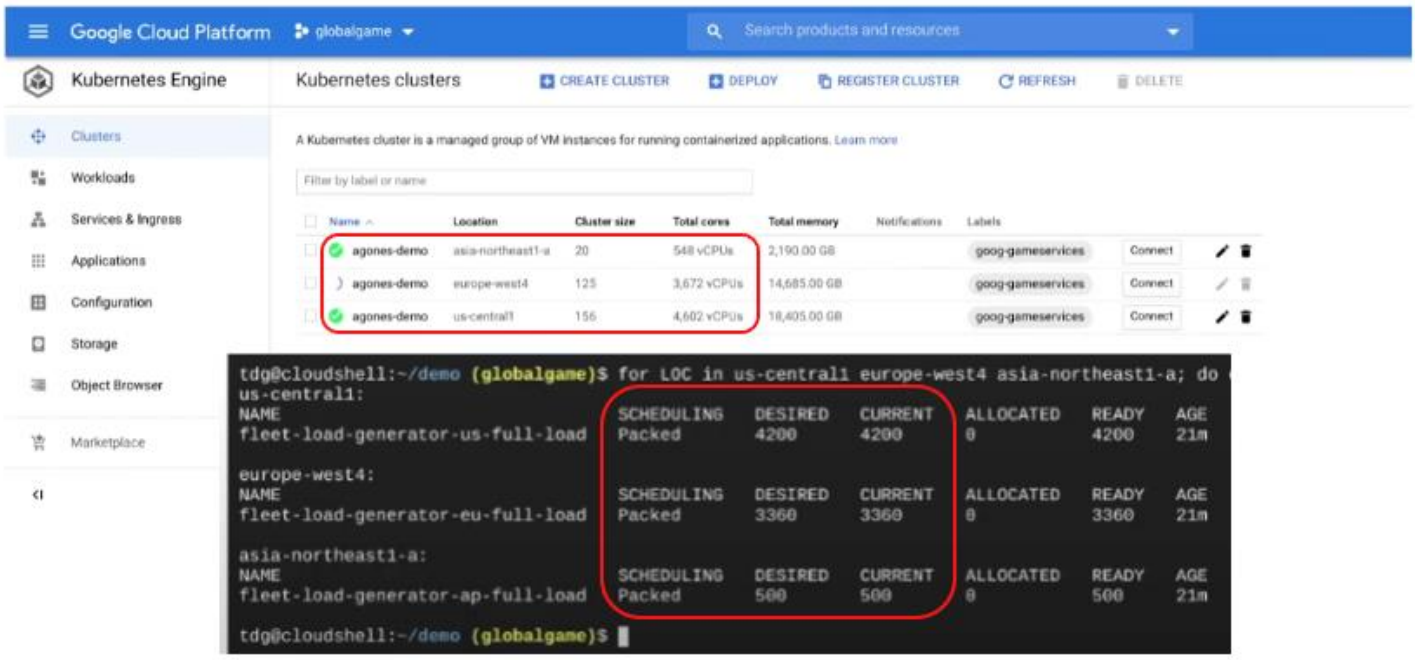
Next, a game server that simulates a battle royale style game was created using the Go open-source programming language. This game server was used to record events, create player information such as rankings, and write them into Google Spanner. The game was deployed by defining it using Agones and GCGS. While the specification appears like a typical Kubernetes resource, it includes Agones abstractions to include gaming concepts such as fleets (groups of game servers). Agones enables Kubernetes to understand the game state and player count, etc., so that it can maintain game state and scale as needed. Gaming workloads are not like typical stateless workloads; a VM on which games are running cannot be shut down and scheduled on another node, since it would shut down the game experience.

The next task was to create numerous game servers, each able to support at least 150 players. Using the configurations specified, GCGS connected to each GKE cluster in each realm and began creating 4,200 servers in the U.S., 3,360 in the

Netherlands, and 500 in Japan. Agones and GKE automatically began adding VMs, creating thousands of pods and tens of thousands of vCPU cores across many clusters in the three regions.

In about eight minutes, the task was complete: 8,060 VMs were created, in three regions around the world, with the ability to support one million players. In Figure 4, the GKE interface displays the increased cluster sizes, CPU cores, and memory; below that is the script showing that the numbers of VMs requested for each region were created.

Figure 4. Auto-scaling Clusters across Regions

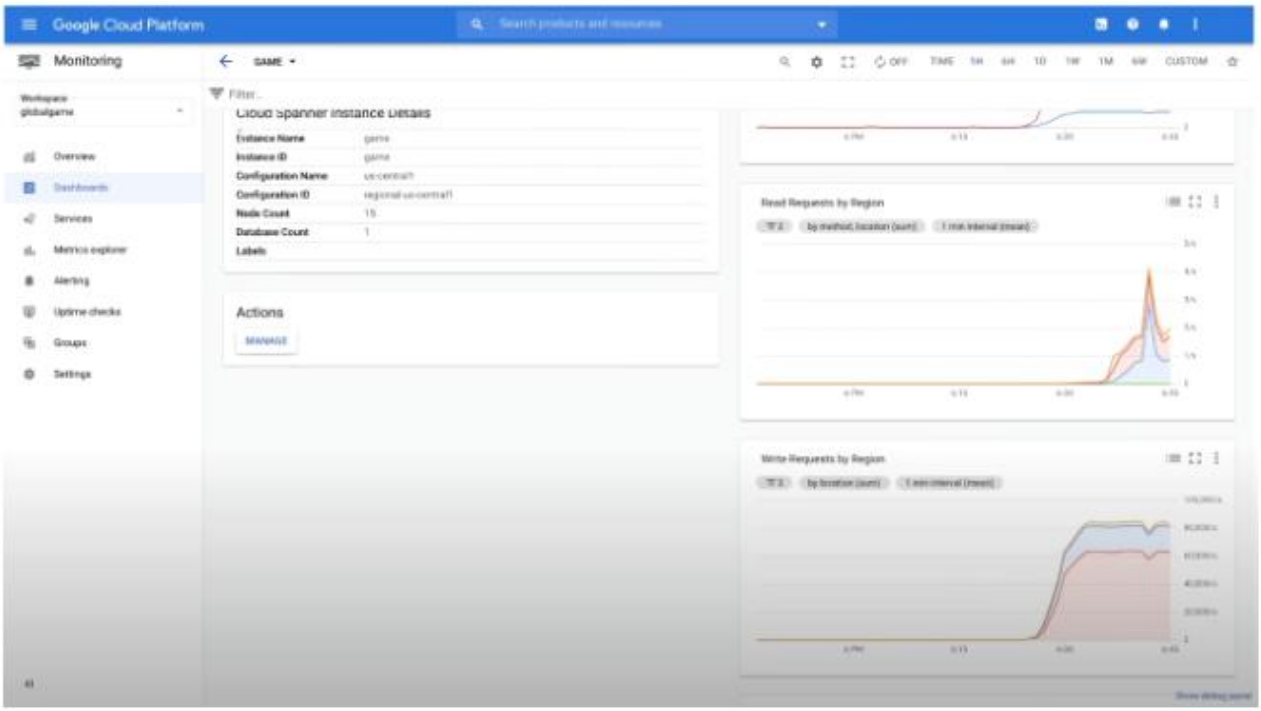


Source: Enterprise Strategy Group

Next, we reviewed the Spanner UI, where we could see the number of nodes in use and the CPU utilization, as well as the more than 83K concurrent requests typical of a large global game.

When the number of concurrent requests increases, adding resources is as simple as increasing the node count in Spanner; no database sharding is required, simplifying the process dramatically. Figure 5 shows the Spanner UI, displaying the details including a single database with 15 nodes, along with the charts of read and write requests in process.

Figure 5. Google Cloud Spanner: Instance Details with Read and Write Requests by Region



Source: Enterprise Strategy Group

Finally, we viewed the activity in the Google BigQuery data warehouse, which was ingesting all the telemetry events since starting up the fleet. The BigQuery table had reached almost 100 GB with more than 800 million rows. With thousands of game servers inserting data, BigQuery was writing more than 800K rows per second.

Why This Matters

Gaming creates huge IT infrastructure challenges, such as deploying and managing enough infrastructure close enough to players to avoid delays; scaling up and down to efficiently support participation peaks and valleys; and keeping the infrastructure maintained and reliable without interrupting play. Inadequate attention to any of these areas can impact revenue streams.

Google offers numerous solutions, including IaaS for complete hosting, management, and scaling of an organization's gaming infrastructure.

ESG validated that in less than 8 minutes, the Google gaming solution using Agones and Google Cloud Game Servers automatically scaled a complete infrastructure to support more than one million users. This included more than eight thousand compute cores on three continents; handling more than 80K concurrent requests per second in a global Spanner instance; and ingesting more than 800K rows per second in a BigQuery data warehouse.

When their cloud gaming infrastructures can scale VMs and databases automatically in response to users coming online, game companies can focus on game development and not on managing infrastructure.

Customer Stories

ESG spoke with two Google gaming customers about their Google Cloud/GKE implementations and its advantages. Today's gaming market requires constant operations, no downtime, agility, and compliance with expanding regulatory requirements; both of these customers are extremely pleased with their Google Cloud/GKE deployments, and with the level of partnership they feel with their Google teams.

Google Helps High 5 Games Grow

ESG spoke with Cesar Bodden, the Senior Director of DevOps Infrastructure and SRE for online gaming company High 5 Games. This company has been creating real-money, social, and casino-style games for more than 25 years, and currently offers more than 250 different games in markets around the world. In recent years, the company decided to update its technologies to support growth and scale in new markets, as well as to simplify delivery of a top-notch experience for users.

Before Google, the bulk of this company's IT infrastructure was comprised of 10 physical data centers around the world using VMware VMs. A few of these data centers remain due to data locality requirements in certain regions, but today 70% of the IT infrastructure is provided by Google IaaS in four regional data centers. The key components are Google Cloud, the global network, and GKE. The company self-manages numerous databases on Google Cloud, including BigQuery for analytics, and is soon to include Google Cloud SQL. Bodden says that this company has partners and integrators who want to join with them because of the services they can offer with Google.

One significant challenge that drove this company to Google was the pain of deployment in new regions. Having to build out new physical infrastructure was difficult and time consuming, and it was challenging to keep consistent across data centers. It also required up-front capital expenses. The company moved to Google Cloud and GKE a few years ago and was well positioned when Covid-19 hit; business skyrocketed during the pandemic, and the company would not have been able to handle it with strictly physical infrastructure.

Scalability

Moving to GKE has provided this company the ability to quickly scale up and down as needed. The ability to match resources to business needs increases profitability. For example, a big holiday in a country can drive 5x the normal volume of business in that region; as Bodden said, "*If we were still on the systems that we were using before, there's no way that we could scale out that rapidly without incurring a tremendous amount of cost.*" With Google, the company builds systems that can scale to 10x whatever the peak of business was for the last six months, and there have been no problems handing these spikes. He continued, "*We don't even get alerted anymore—it's no longer a big issue for us. We just get told by our alerting systems after the fact that they scaled to a certain point, it was all handled, and scaled back. Where before, it was all hands on deck, sweating and panicking. Google affords us the freedom from distress.*"

Ease of Deployment

Google Cloud and GKE have made this company more technology-agnostic and provided automation to easily create geographic redundancy. Now, the company can quickly deploy new systems and launch in new regions without stress, and with the consistency the company wants. Importantly, it is also much easier to zone off regions to accommodate required traffic boundaries. *"With physical data centers, it can take months to provision the hardware, get the network installed, and bring up the facility; with Google, my team has brought up a whole region of the world in 12 hours. That gives us access to hundreds of millions of potential new customers."* All of this automation saves money and frees up engineer time. And for some areas of the world, the Google network delivers faster service, delivering an improved level of game play for customers. Finally, while certain regions have required physical data centers, when their regional concerns change and they allow Google, it is extremely easy to deploy.

Ease of Management

Management is significantly easier, starting with not having to send out IT staff to physical data centers. Says Bodden, "*We can redeploy 15, 20 clusters as needed, bring them down, bring them back up, reset, whatever we need in a couple of minutes, rather than what would have taken us days or weeks previously."* In addition, IT staff have been able to eliminate tedious technical tasks and instead focus on new technologies, reshaping their career trajectories.

Reliability

Reliability has been dramatically improved with the move to Google Cloud and GKE. This company had several major outages per year with the old infrastructure, but with Google and its automatic healing, uptime SLAs have been maintained 100%. This is especially important for the company's partner and integrators. In addition, the redundancy with Google means that if a major disaster occurs, the company can be back up and running in hours instead of the weeks it would have taken previously. Google also helps by using best practices and providing timely information about service updates.

Security

Google's security features make a big difference, with security teams focused on specific areas. Said Bodden, *"DDOS is a big concern in the gaming market, but with Google's built-in DDOS mitigation, I can sleep at night. Before Google we had a DDOS attack, and it took us four days to recover. I can't say how many attacks we've had now, because mitigation happens automatically."*

Cost Savings

Google has also saved the company money while delivering a better infrastructure. *"Don't get me wrong, it's expensive,"* said Bodden. *"But if you look at the price that we would have been paying with iron . . . this would have probably cost us 5, 10, maybe 15 times what we paid out with Google."*

Comparing Google with Physical Data Centers

High 5 Games uses mostly Google infrastructure, but must keep physical data centers in certain areas of the world; as a result, they can clearly see the difference that Google makes. The difference, according to Bodden, is monumental. *"It's not even the difference between day and night, it's the difference between day on this planet and night in a black hole somewhere."* There are no more worries about massive pre-planning, whether servers will hold up or hit a capacity limit, whether a particular VMware version supports a feature, etc.

In summary, he said, *"One thing that matters to me most is that I totally trust Google. Name a provider and I've probably used them in my career. And I can honestly say, well, this is my first time using Google and it's been a better experience than all the others so far, because of the ease of deployment."*

Unity Technologies Leverages Google for Efficiency, Scale, and Simpler Operations

ESG also spoke with Alan Page, Senior Director of Engineering at Unity. He is responsible for product and site reliability engineering, which includes infrastructure, continuous integration (CI) systems, tooling, and DevOps. Unity creates game development software that is widely used, with many game developers installing its game engine-agnostic software development kits (SDKs). All of the services Unity offers are microservices-based. In addition, the Operate Solutions division provides internet-based game services, including ads, game analytics, game economy (e.g., cloud inventory and wallets), and content delivery. Game developers who want to include ads in their games use one SDK; if they want to include in-app purchases they can add another SDK.

Life is Better with Google Cloud and GKE

Google Cloud and GKE are the key Google technologies Unity uses, supporting 95% of Unity services; Google Cloud is now the default for new projects. The company has a large investment in Google infrastructure, with 10,000 VM instances and 1,500 GPUs for predictive analytics often running at once. Before Google, the company had an internally built container orchestration system, but *"Moving to GKE has made our life much, much better,"* said Page. He commented that GKE has many more features and is more efficient than their home-grown orchestrator.

Autoscaling for Critical Business Processes

The biggest part of the business is advertising. Said Page about ads, *"Everything comes through the same pipeline, and we use autoscaling liberally. Our business scales up a lot on weekends and holidays—and the first few months of pandemics when people are home more often. We rely on Google's autoscaling to scale up and down as needed. Google's services expand to handle our load."* The company uses Google Cloud PubSub and Dataflow to ingest ad events, which are critical to revenue. The notifications that come from advertising include installation and actual game play; these notifications drive revenue for advertisers and for Unity. The company also uses Big Query, Spanner, Looker, and Cloud Armor.

Fast, Agile Development

Unity enjoys huge benefits from using Google, starting with not having to manage infrastructure and container orchestration. A big benefit is the ability to move as quickly as they want. *"We are able to move a lot faster with GKE*," said Page. *"Our teams are pretty agile, and some of our services have to be able to deploy comfortably and safely 20 times a day. We have had microservices go from idea to deployment with monitoring, alerting, and load balancing in a day – it's seamless to get up and running and do something significant. We trust the [Google] infrastructure."* The company has now standardized the way they deploy projects with autoscaling, enabling new services to be deployed much faster. In addition, the ability to apply committed usage discounts across the entire account has resulted in significant discounts, a key benefit of consolidating in the Google Cloud.

Reliability and Proactive Assistance

Unity appreciates the many ways that Google keeps Google Cloud and GKE infrastructure up and running, including self-healing, security updates, and best practices, etc. Unity has weekly meetings with his Google team, and Page feels well informed without having to search for information about what's changing in Google Cloud. Recently, Google approached him about proactively reviewing Unity's architecture to understand how to better support the business; Google has also reached out with little bits of advice, like how to increase efficiency, or how to better use TensorFlow for modeling. *"I have become reliant on them. I feel very comfortable and safe with them highlighting what I should be worried about. They proactively let me know about deprecating a logging API, providing the exact directions to migrate to something newer. They are committed to ensuring that nothing they do causes any problems for us. So, when my CFO asks if we really need premium support, I say 'hell yeah!'"*

> *"Google has been really easy to work with. The Google folks have been really good partners and helped us move to GKE. I forget they're not part of our company sometimes, they are so closely aligned with us, helping us out, and even being proactive."*
>
> *- Alan Page, Unity*

Comparison with Physical Infrastructure

A small percentage of operations requires physical data centers, and the difference is significant. These data centers require teams of six to eight people dedicated to maintaining infrastructure. *"It's a chunk of their time keeping those things up and running. They just had to do an Ubuntu upgrade, and that's just stuff we don't have to deal with anymore,"* said

Page. He continued, *"You have to look at total cost of ownership between bare metal and cloud. It can be more efficient, more scalable, and easier to maintain in the cloud."*

The Bigger Truth

Gaming is a huge business around the world; by some estimates, gamers make up a quarter of the world's population. Today's technologies have made the gaming experience much faster, more real, and more interactive for users, while creating huge revenue opportunities for game companies.

But delivering the level of experience gamers expect today demands a lot of infrastructure, constant feature additions and updates, and the highest levels of scalability, reliability, and security. Container and microservice architectures speed development and deployment, but this architecture is challenging to create and maintain.

Google offers secure, reliable, scalable infrastructure solutions for gaming, especially with Google Cloud and Google Kubernetes Engine. By removing the burden of building, operating, and supporting on-premises infrastructure, Google lets gaming companies focus on what they do best—creating exciting games—instead of on managing infrastructure.

From a demonstration, ESG validated:

- The ease and speed of deploying and scaling a gaming infrastructure with resources in the U.S., the Netherlands, and Japan, using Google Cloud, GKE, Google Cloud Game Server, and Agones.
- In about eight minutes, more than 8,000 VMs were created in the three regions, with the ability to support one million players.
- Automatic scaling of Spanner, which added nodes without sharding to handle more than 83,000 concurrent requests.
- Automatic scaling of BigQuery, which wrote more than 800,000 rows per second as thousands of game servers inserted data.

ESG also spoke with two gaming customers who heaped praise on Google for simplifying management of their gaming infrastructures, reducing costs compared with bare metal, and enabling the scale, reliability, security, and performance that their customers demand. The quotes below give you an idea of their results.

- "With physical data centers, it can take months to provision the hardware, get the network installed, and bring up the facility; with Google, my team has brought up a whole region of the world in 12 hours. That gives us access to hundreds of millions of potential new customers."
- "Google has been really easy to work with. The Google folks have been really good partners and helped us move to GKE. I forget they're not part of our company sometimes, they are so closely aligned with us, helping us out, and even being proactive."

The cloud may not be the right solution for every customer. But if you are looking for a way to increase security, scalability, reliability, and performance for your game customers, ESG recommends taking a good look at Google Cloud solutions. Investigate the features and the total cost of ownership, and you may just be able to focus on your games and let Google handle the infrastructure.

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