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Games

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Editor's Note

This month's magazine is all about games—not Scrabble, not Uno, not Twister, and certainly not hide-and-seek.

No, we're talking the big business of online, multiplayer games. And did you know that approximately 90% of large, public game companies are running on the AWS cloud? Yep, I'm talking Fortnite (Epic), Ubisoft, Nintendo, and more. I had the opportunity to sit down with a senior tech leader for AWS Games, who talked about why companies are moving to the cloud from on-prem, and it's about a whole lot more than just games for entertainment. We're got into the big-money world of competitive eSports as well as the gamification of learning processes and economics.

Consider Twitch, often defined as Amazon's live streaming platform for gamers. But Twitch is much more than a gaming platform. For example, AWS Live Video on Twitch (https://www.twitch.tv/aws) offers live streaming about everything from how to develop serverless apps and robots to interactive quiz shows that help you prepare for AWS Certification exams. And of course you can also learn about the technology that powers your favorite video games.

We hope you'll find this edition of Architecture Monthly useful, and we'd like your feedback. Please give us a star rating and your comments on Amazon. You can also reach out to aws-architecture-monthly@amazon.com anytime.

For September's magazine, we've assembled architectural best practices about games from all over AWS, and we've made sure that a broad audience can appreciate it.

- **Interview**: Nari Gopala, Tech Leader, AWS Games
- **Case Study**: Epic Games Uses AWS to Deliver Fortnite to 200 Million Players
- **Training**: Deploy Dedicated Game Servers for multiplayer Games
- **Blog post**: Oasis Games and Iron Mountain Interactive Power Hero Sports Game Steel Circus with Amazon GameLift
- **Solution**: Gaming Analytics Pipeline
- **Whitepaper**: Optimizing Multiplayer Game Server Performance on AWS

Annik Stahl, Managing Editor

Interview:
Nari Gopala
Tech Leader, AWS Games

I recently met with with Nari Gopala, the Tech Leader at AWS Games to talk about Amazon Game Tech and the future of the Games industry.

What is Amazon Game Tech?

Amazon Game Tech (https://aws.amazon.com/gametech/) brings together all the different solutions we have within the Amazon ecosystem, including Amazon Web Services, under one umbrella and is focused on solving problems for our customers in the games industry.

Who are the customers in the Games industry that use AWS?

More than 90%of the world's biggest public game companies, including Activision, Supercell, and Ubisoft, are using AWS.

What's the service portfolio of Amazon Game Tech?

Amazon Game Tech portfolio includes the primary (or core) AWS services, such as compute, storage, databases, AI, and ML, as well as a few managed game services that we offer as part of this portfolio such as GameLift, GameSparks, and Lumberyard, the content creation engine for games. In addition to these AWS technologies, we also have other Amazon services such Twitch, GameOn from Amazon retail, and Alexa.

What all does AWS offer for game developers?

Unlike many other industries, the game industry is still at an inflection point where a lot of the workload is still running on-premise. So, one of the first things customers engage us on is to guide them how they can move their infrastructure to the cloud. Maybe they have a game that suddenly becomes popular and they need to scale up right away. Or perhaps they're building something they feel is going to have a worldwide mass appeal and they have to be in several regions in the world closer to the players. With our global infrastructure and compute, AWS offers solutions that are optimized for running games' server workloads in the cloud. So that's typically one of the main engagement points.

Games is a big business, and analytics is another big reason why games customers get involved and interested in what AWS has to offer. There is a lot of data generated from

games, and almost everything that a player does in a game is tracked, so a lot of that data have to be turned into insights that are actionable and help the customer make changes to the game to improve the player experience. All of that's doable with an end-to-end analytic pipeline that they can build within AWS.

There's also a lot of interest in artificial intelligence (AI) and machine learning (ML) for various use cases such as anomaly or cheat detection, player acquisition, monetization, and churn prediction, all of which, when managed through right ML solutions, can positively impact player experience.

When do you typically see a studio wanting to make the switch from running their own on-prem game servers to the cloud?

That is an interesting question. What we typically see in the games industry, is that a lot of studios operate like startups, and that's how they model their business. So, oftentimes games are created by a small team of people or, in some cases, it's a small studio. And in some cases, for some of our big customers, there are multiple studios that they own as part of a large game-publishing, game-development business. There's always this push and pull of what gets decided at the studio level and what gets decided at the central tech/IT level. Different customers have different models where sometimes it's the studios that decide when they want to move their game to the cloud and sometimes it's the central tech/IT people who make such decisions. From a lifecycle of a game development, the decision to operate a game in the cloud is often made early, certainly before launch. There are also few cases where long running game titles or franchises have made the transition from on-premises to cloud post launch.

Today, one of the spots where we see the industry relying on purely on-prem is in the game development pipeline. Since some of the operational workloads are already in the cloud, it makes all the more sense, from a scaling and efficiency perspective, to have the development process in the cloud, as well.

Is AWS really just for large studios turning out AAA titles?

No—we actually think that we can help anyone build their next game and run it on the cloud. We don't typically differentiate how big a customer you are, whether you're an enterprise customer, a start up, or a small studio working out of a garage. Even a small game could become the next phenomenon, depending on the right things coming together at the right time. Our technology and mental model is that we can help anybody who's building a game to scale it as needed, help it run better, keep their operational costs lower, and provide a secure and global infrastructure.

What's your outlook for the games industry and, what role will cloud play in future development efforts?

The games industry is estimated to be generating over $150 billion and growing at a fair clip. Just to compare, the movie box office revenue numbers are around $40 to $45 billion. If you take just a game release like Red Dead Redemption 2, it grossed close to $725 million in just the first 72 hours. It was one of the most successful media releases in history.

The last two generations have taken to games in an unprecedented way not seen before. While there has always been a core percentage of people who were into games and played games on PCs or consoles in the past, these last two generations have literally grown up with smart mobile phones in their hands, loaded with apps and games. And because of the proliferation of such devices, and with broadband and WiFi being so easily accessible, games has become one of the most important source of entertainment.

Another emerging area in games is called eSports or competitive gaming, which takes it to the next level. There is this whole new segment of players who are actually treating games like any other sport. There are professional gamers as well as global leagues that do this now on a competitive basis, broadcasting the competitions on TV that you can watch like you would the World Cup.

The other trend we're seeing is gamification of learning processes. Universities, schools, they're all starting to experiment and ask themselves, "Would the whole educational process be different if it was gamified?" There have been some interesting results, though I'm not saying it's all good, but I think there's definitely work being done there to see if we could take the ideas from virtual worlds and apply it to the real world. While it is not talked about much, even policymakers in public sector are starting to look at how people are managing these large virtual economies and see if there learnings that can be applied to real world economics in cities and countries.

To summarize, I think games as an industry is growing so fast that we think this is this is going to become one of the premier modes of entertainment for the coming generations. And we also see various potential application of games and games industry to improve the lives of real people in the real world.

Case Study:

Epic Games uses AWS to Deliver Fortnite to 200 Million Players

Available online at: https://amzn.to/AWS-Games-case-study

Epic Games uses AWS to deliver Fortnite to more than 200 million players around the world, support growth of more than 100 times in just 12 months, and perform analysis that helps it improve the game. Fortnite, one of the world's most popular video games, runs nearly entirely on AWS, including its worldwide game-server fleet, backend services, databases, websites, and analytics pipeline and processing systems. Epic Games uses a range of AWS services to provide the availability it needs to support peak usage more than 10 times that of non-peak, as well as the scalability to host game events with all of its 200 million users invited. Chris Dyl, director of platform at Epic Games, spoke onstage at re:Invent 2018.

(**View video at**: https://amzn.to/AWS-Games-Fortnite)

Training:
Deploy Dedicated Game Servers
for Multiplayer Games

Available online at: https://amzn.to/AWS-Games-Training-Deploy-Servers

This classroom session will teach you how to deploy dedicated game servers for multiplayer games in minutes with Amazon GameLift. Chris Byskal and Geoff Pare will explain the complexities and requirements of doing this without Amazon GameLift and teach you how to deploy your first fleet with Amazon GameLift. They'll then teach how to get insights and debugging logs from the Amazon GameLift console, and walk through setting up autoscaling rules to reduce costs without hurting player experience. You will walk away understanding how using Amazon GameLift will save you time and money, and you'll be able to replicate the classroom sessions to deploy their first fleets on Amazon GameLift.

By Ellie Lawson

Available online at: https://amzn.to/AWS-Games-Blog

Players love jumping into fast-paced and action-packed multiplayer sports games.

But how do you make players feel truly immersed and engaged with other players when in reality, they're likely scattered across the globe?

For Oasis Games and Iron Mountain Interactive, the speed of both gameplay and the game's supporting infrastructure is key.

Their latest title, Steel Circus (https://amzn.to/AWS-Games-SteelCircus), is a sci-fi sporting event that sees players use skill, strategy, and speed to take control of one of several champions and compete in 3-3 online matches.

When approaching building online matches for Steel Circus, Oasis Games and Iron Mountain Interactive knew a reliable technology provider was essential. "To give our players the best possible experience in a fast-paced game, low and stable latency is critical," explains Nikolaus Pöttler, DevOps Engineer of Iron Mountain Interactive.

Since launching closed Alpha, Steel Circus has been built on AWS, relying on game server and matchmaking management from Amazon GameLift. "We use Amazon GameLift to

maintain our real-time service. It handles our auto-scaling and deployment of servers, as well as the matchmaking of players around the globe," said Pöttler.

As the game continues through to Steam Early Access (https://amzn.to/AWS-Games-Steel-Circus) and development requirements grow, Oasis Games and Iron Mountain Interactive are able to continually provide a great experience and innovate on behalf of their players. Daniel Lin, Marketing VP of Oasis Games said, "We constantly listen to player feedback and make regular updates including new champions, arenas, customizations, and balancing fixes."

And with Amazon GameLift, the team are able to dedicate more of their time to the game, and think less about infrastructure management. "GameLift is powerful because it frees us up to think about those player facing features. Using a few simple configuration options we can automate the scaling of game servers and cut down the complexity of matchmaking players quickly and fairly," said Pöttler.

To learn more about Amazon GameLift, visit the product detail page (https://amzn.to/AWS-Games-GameLift). You can also discover all of what Amazon has to offer for game developers by visiting the Amazon Game Tech homepage (https://amzn.to/AWS-Games-GameTech).

Available online at: https://amzn.to/AWS-Games-analytics-pipeline
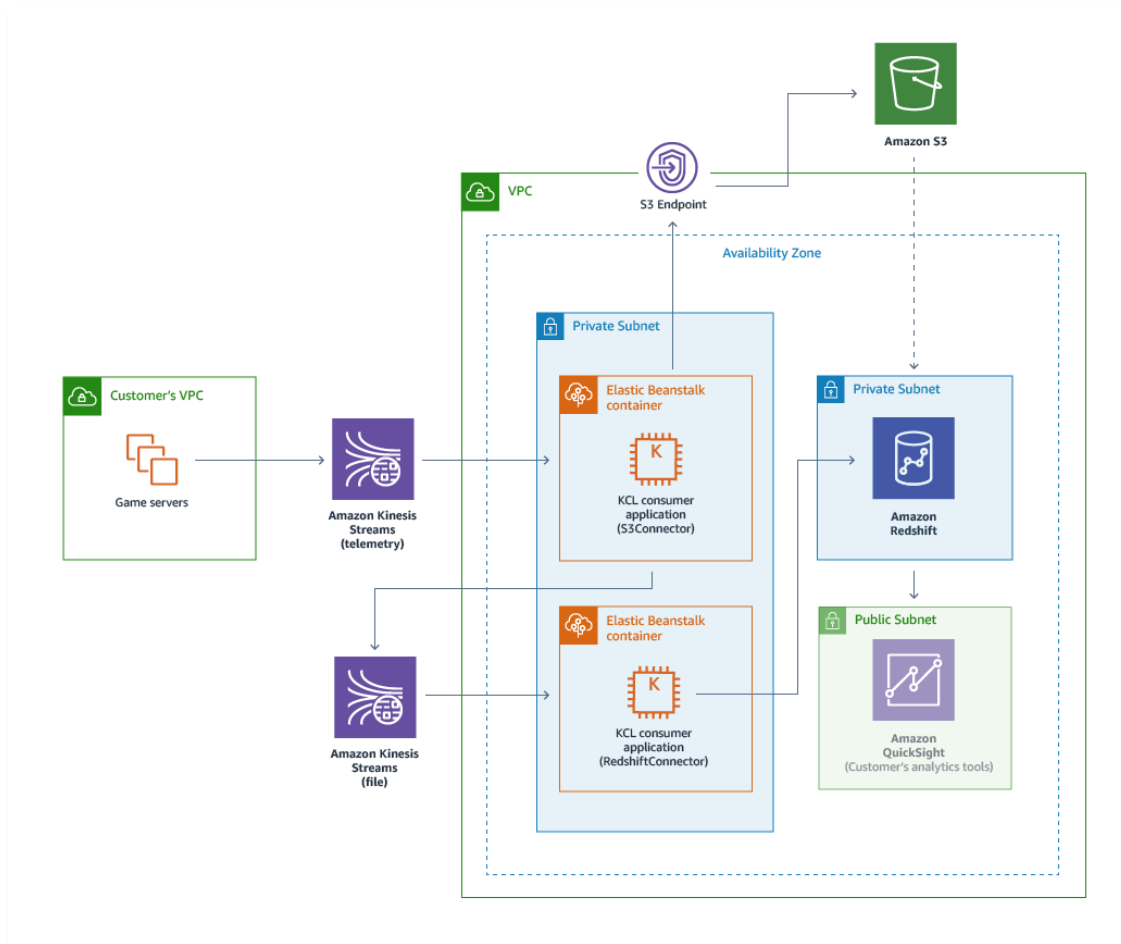
What does this AWS Solution do?

Given the dominance of the free to play model and in-app purchases offered in the gaming industry, games have become more of a service than a product. With this change, in-game analytics is critical to constantly engage and monetize users to stay competitive.

Amazon Web Services offers a comprehensive suite of analytics solutions to help you keep your players engaged and optimize your game to increase revenue. Amazon Kinesis, a platform for streaming data on AWS, offers powerful services that make it easier to analyze player experiences, advertising effectiveness, and game usage statistics in real-time to improve your user's experience.

This webpage introduces an AWS solution that helps customers more easily ingest, store, and analyze gameplay data. The Gaming Analytics Pipeline automatically provisions and configures the AWS services necessary to start consuming and analyzing gameplay data in minutes

AWS Solution Overview

AWS offers a solution that automatically launches and configures Amazon Kinesis Streams to ingest gameplay data, Amazon Kinesis Client Library (KCL) consumer applications running on AWS Elastic Beanstalk to process and filter that data, Amazon Simple Storage Service (Amazon S3) to store the data and act as a gateway to other AWS services, and Amazon Redshift to act as a queryable backend data store. The diagram below presents the Gaming Analytics Pipeline architecture you can deploy in minutes using the solution's implementation guide and accompanying AWS CloudFormation template.

Gaming Analytics Pipeline Architecture

Game servers transmit gameplay events to an Amazon Kinesis stream (called the telemetry stream) that collects and processes those events.

An application validates, sanitizes, and enriches the events; archives the events as a batch telemetry file in Amazon S3; and sends a pointer to the location of the batch telemetry file to a separate Amazon Kinesis stream (called the file stream) that initiates the process of loading the data into Amazon Redshift.

A second application loads batches of events from Amazon S3, deletes duplicate events, and inserts events into tables in Redshift. A third application performs routine database tasks and maintenance. AWS Elastic Beanstalk is used to manage the deployment of the solution's three applications.

The solution also includes a data generator you can use to test the pipeline and a heat map generator that allows you to generate heat maps based on various parameters.

View the deployment guide: https://amzn.to/AWS-Games-deployment

Real-World Example

Overview of an AWS powered Gaming Analytics Pipeline Solution

https://amzn.to/AWS-Gaming-analytics-solution

A quick overview of implementing a Gaming Analytics Pipeline Solution on AWS.

Whitepaper:
Optimizing Multiplayer Game Server Performance on AWS

Available online at: https://amzn.to/AWS-Gaming-Whitepaper

Abstract

This whitepaper discusses the exciting use case of running multiplayer game servers in the AWS Cloud and the optimizations that you can make to achieve the highest level of performance. In this whitepaper, we provide you the information you need to take advantage of the Amazon Elastic Compute Cloud (EC2) family of instances to get the peak performance required to successfully run a multiplayer game server on Linux in AWS.

This paper is intended for technical audiences that have experience tuning and optimizing Linux-based servers.

Introduction

Amazon Web Services (AWS) provides benefits for every conceivable gaming workload, including PC/console single and multiplayer games as well as mobile-based, social-based, and web-based games. Running PC/console multiplayer game servers in the AWS Cloud is particularly illustrative of the success and cost reduction that you can achieve with the cloud model over traditional on-premises data centers or colocations.

Multiplayer game servers are based on a client/server network architecture, in which the game server holds the authoritative source of events for all clients (players). Typically, after players send their actions to the server, the server runs a simulation of the game world using all of these actions and sends the results back to each client.

With Amazon Elastic Compute Cloud (Amazon EC2) you can create and run a virtual server (called an instance) to host your client/server multiplayer game.1 Amazon EC2 provides resizable compute capacity and supports Single Root I/O Virtualization (SR-IOV), high frequency processors. For the compute family of instances Amazon EC2 will support up to 72 vCPUs (36 physical cores) when we launch the C5 compute-optimized instance type in 2017.

This whitepaper discusses how to optimize your Amazon EC2 Linux multiplayer game server to achieve the best performance while maintaining scalability, elasticity, and global reach. We start with a brief description of the performance capabilities of the compute optimized

instance family and then dive into optimization techniques for networking, CPU, memory, and disk. Finally, we briefly cover benchmarking and testing.

Read the full whitepaper here: https://amzn.to/AWS-Gaming-Whitepaper

Real-World Example

AWS GameTech on Twitch

https://www.twitch.tv/amazongametech/videos