The 2024 AWS guide to generative AI for **game developers**

Ship better games faster, revolutionize player experience, and optimize publishing operations with generative AI

This eBook is for game industry decision makers who are interested in learning how generative AI can improve games.

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Explore the game-changing possibilities of generative AI

From faster game development to more engaging player experiences and streamlined publishing, generative artificial intelligence (AI) is transforming the game industry today—and is primed to ignite a new era of innovation in the years ahead. Game developers that leverage generative AI can better meet player's needs and desires, but they must develop the right strategy and invest in the right tools to make the most effective use of the technology.

The following pages identify practical generative AI capabilities, explore the technology's value for game studios across three key application areas, offer thought starters for role-relevant use cases, and much more.

The unique expertise and experience of AWS

With **more than 15 years' experience** supporting developers such as Sony Interactive Entertainment, Epic Games, Gearbox Software, Riot Games, Behaviour Interactive, Warner Bros. Games, and Ubisoft, Amazon Web Service (AWS) understands how to address the unique challenges and demands of the games industry.

Our expertise in AI spans over two decades, from groundbreaking experiments in the early days of Amazon retail to **democratizing generative AI** today. AWS has helped **more than 100,000 businesses** of all sizes and industries—including many game studios—leverage AI to improve their products, operations, and customer experiences.

AWS understands how to address the unique challenges and demands of the games industry.

Terms to know

Artificial intelligence (AI)

The field of computer science dedicated to solving cognitive problems commonly associated with human intelligence, such as learning, creation, and image recognition. Modern organizations collect large volumes of data from diverse sources like smart sensors, human-generated content, monitoring tools, and system logs. The goal of AI is to create self-learning systems that derive meaning from data. Then, AI can apply that knowledge to solve new problems in human-like ways. For example, AI technology can respond meaningfully to human conversations, create original images and text, and make decisions based on real-time data inputs. Organizations can integrate AI capabilities in their applications to optimize business processes, improve customer experiences, and accelerate innovation.

Machine learning (ML)

The science of developing algorithms and statistical models that computer systems use to perform tasks based on patterns and inference rather than explicit instructions. ML is a subset of AI and the foundation of generative AI.

Generative AI

A type of AI that can create new content and ideas, including conversations, stories, images, videos, and music. It is powered by large models that are pretrained on vast amounts of data, commonly referred to as foundation models (FMs).

Foundation model (FM)

An ML model that is trained on a broad spectrum of content, capable of performing a wide variety of tasks—such as understanding language, generating text and images, and conversing in natural language—and serves as a foundation for specialized generative AI applications.

Large language model (LLM)

An ML model that is trained on a large corpus of text to recognize, translate, predict, and generate new text. Some LLM examples are BERT, GPT, PaLM, BLOOM, LLaMA, Chinchilla, Claude, Command, Jurassic, and **Amazon Titan**.

Hallucination

A response generated by AI that contains false, misleading, or nonsensical information. Sometimes called "model hallucination," the behavior is caused by AI's limited contextual understanding of human language and can be exacerbated by poor-quality training data.

Put generative AI to work for common game development tasks

Before game studios can unlock the value of generative AI, it's important that they develop a fundamental understanding of how the technology works, what it can do, and how it's being used in the game industry today. This section provides an overview of these topics to use as a reference and starting point in the fast-evolving field of generative AI.
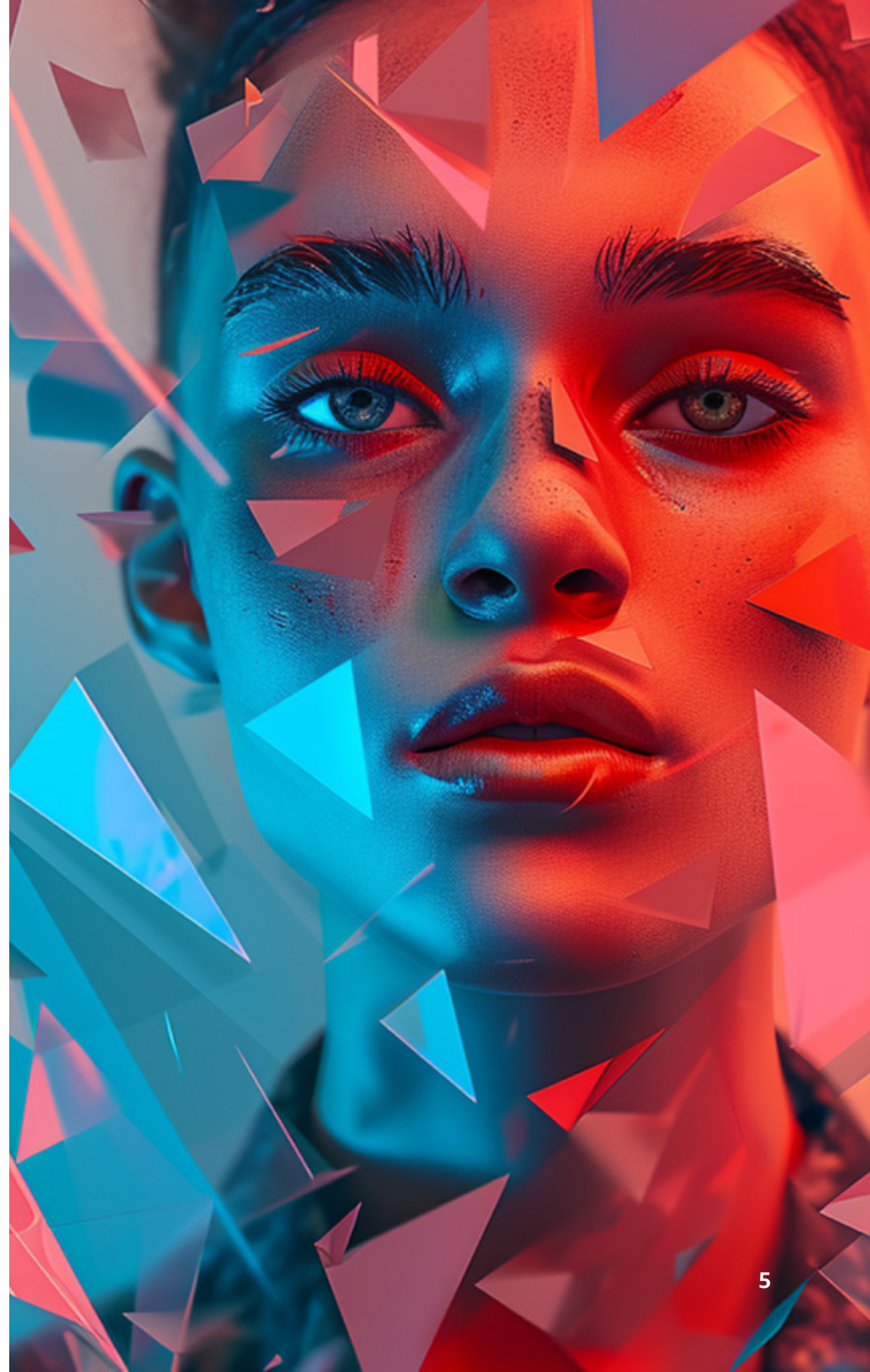
Capabilities

Image generation: Create concept art, game assets, and landscapes; render fully textured game images and video; generate marketing assets like personalized game trailers.

Audio generation: Produce music, sound effects, and character voice-overs; **orchestrate background instruments** when given an input melody.

Dialogue generation: Create background dialogue for non-playable characters (NPCs); personalize expressions, dialogue, and narrative to player preference.

Text generation: Draft descriptions for in-game experiences, specific narratives, or the game itself; leverage language-guided editing for game workflows; generate or refresh marketing and sales collateral; increase personalization.

Common tasks

Automated customer support: Streamline customer self-service processes and reduce operational costs by deploying AI-powered chatbots and virtual assistants.

Agent assist and conversational analytics: Improve agent performance and reduce resolution times by equipping customer service teams with AI-powered knowledge search, call summarization, and post-call analytics.

Personalization: Deliver new and deeper gaming experiences that are unique to individual players; increase customer engagement with curated messages and offers.

Code generation: Accelerate application development with **AI-generated code suggestions** based on developer comments and existing code.

Conversational search: Improve employee productivity with conversational interfaces that use AI to summarize complex content, locate accurate information, and respond to user queries at lightning speed.

How Scenario produces 100,000 images daily using generative AI on AWS

Scenario was founded to revolutionize in-game and marketing asset production. The company set out to empower developers and artists with easy-to-use generative AI tools that could create these assets at warp speed.

Scenario knew it needed to move fast to meet industry demand for its offering. To get up and running quickly, Scenario went all in on AWS—building its generative AI offering using **Amazon Elastic Container Service** (Amazon ECS), a fully managed container orchestration service, and **AWS Cloud Development Kit** (AWS CDK) to accelerate cloud development.

With its API-first offering, Scenario's customers can now generate hundreds of usable characters, props, and landscapes for its games in minutes from team workspaces or directly within their games.

Responding to game developers' needs, Scenario achieved far improved consistency of generated assets, removing rework and unpredictability for its customers. This higher standard of quality achieved on AWS has made Scenario appealing in industries outside games, such as media and advertising.

Read the full success story ›

2 MONTHS
to build its generative AI offering

MILLIONS
of images provided with only 3 engineers on staff

40 COUNTRIES
scaled to in 3 months

AWS services used

AWS Batch

Efficiently run hundreds of thousands of batch and ML computing jobs while optimizing compute resources.

Learn more ›

Amazon API Gateway

Allow developers to easily create, publish, maintain, monitor, and secure APIs at any scale.

Learn more ›

AWS CDK

Accelerate cloud development using common programming languages to model applications.

Learn more ›

Amazon ECS

Simplify deployment, management, and scaling of containerized applications.

Learn more ›

The 3 application areas for generative AI in games

To help studios start or expand their journeys, the following chapters classify generative AI for games use cases into three application areas. Read on to explore each area in detail—or use the links below to jump to a specific area.

APPLICATION AREA #1:

Accelerating game development

Generative AI can accelerate ideation, communication, prototyping, and development of game concepts and assets. Development teams can explore more options when assisted by generative AI.

Read more ›

APPLICATION AREA #2:

Innovating new player experiences

Generative AI can create an infinite variety of characters, items, and world elements that are unique to each player—and allow players to interact with them in new, open-ended ways. It empowers creators to craft their own experiences without technical barriers. And AI-powered assistants can help new players get up to speed quickly, reducing frustration and rage quits.

Read more ›

APPLICATION AREA #3:

Optimizing publishing operations

Marketing and social media teams can use generative AI to spin up new content in seconds, personalize and refresh collateral, and explore new ideas. With conversational search and media summarization tools powered by generative AI, customer support and other departments can find needed information in a snap and rapidly grow their understanding of complex topics.

Read more ›

Ship better games faster

Key functionalities

- Generate concept art, game assets, characters, avatars, dialogue, narratives, and voice-overs

- Assist with coding, game prototyping, and incorporating player feedback

Generative AI is emerging as a critical tool in game creators' mission to release higher-quality games faster and more efficiently. The technology can boost productivity and accelerate results by automating or simplifying a variety of tasks and eliminating time-consuming or repetitive work. This allows game creators to focus more on what they love: shipping fun, innovative games that delight players and keep them coming back for more.

Remove toil, experiment more

Generative AI can be particularly beneficial in the initial phases of game development. Creators can use the technology to generate temporary content, including characters, items, scenery, animation, music, and voice-overs. With the ability to generate and swap out elements quickly, creators can explore a broader range of options for the game's mood and feel before deciding on a final direction.

Replacing the drab, gray placeholder boxes typical of early demos with representative AI-generated content can help testers and developers better understand the game vision and focus on the most valuable improvements. It can allow the game team to share its full vision earlier and with greater ease, improving pitches to investors and publishers and potentially even increasing media buzz and fan anticipation.

Code assistants powered by generative AI can further accelerate development by automatically providing code suggestions. Tools that can be trained on existing code and developer comments are particularly helpful, as they can provide highly relevant and accurate suggestions. These tools can also drive faster backend development, saving even more time.

Scale to new markets faster

Game localization is another area of development where generative AI yields value by opening games up to new audiences, as today's LLMs can be used to localize existing documents or text. Studios can use this capability and accelerate the translation and localization of customer support or game reference guides for various languages and markets.

The next frontier is to use generative AI to create synthetic voice-overs of the game script that are automatically translated and localized for specific markets. This can shorten development cycles while helping game studios address critical talent gaps for certain languages.

Drive efficiency and teamwork

Generative AI can also be used to streamline game development workflows and improve collaboration. To illustrate this, consider the process of creating in-game music. Studios can use generative AI to draft clear descriptions of desired sounds and improve the quality of feedback provided to composers. Even better, studios can furnish composers with AI-generated example music—which may communicate the vision more effectively than text alone.

By applying these same principles to other game development processes that require collaboration, studios can begin to see the potential of generative AI to improve teamwork and streamline communication across a myriad of game development areas.

Revolutionize the player experience

Key functionalities

- Power new in-game features, lifelike NPCs and dungeon/game masters, personalized experiences, and player assistants/coaches

- Generate an infinite variety of NPCs and levels/dungeons

As game developers continue to adopt and experiment with generative AI, they are discovering the technology's potential to reinvent the player experience. Generative AI can offer gameplay that adjusts to individual preferences in real time, create an infinite variety of new characters, level designs, and missions, power lifelike interactions with dynamic NPCs and virtual assistants, and much more.
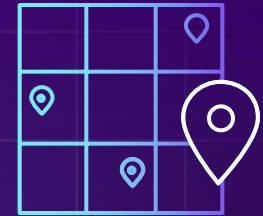
Adapt to players in real time

Studios can use generative AI to dynamically adjust gameplay based on player choices, preferences, and feedback. This can allow for truly personalized experiences that feature quests, levels, and other game mechanics uniquely tailored to each player.

Generative AI can also allow players to enjoy realistic interactions with NPCs. This can be achieved with models that analyze existing game assets to generate new dialogue, voice-overs, and animation based on player input. Imagine entire worlds populated by lifelike NPCs that players can talk to, team up with, fight, or build relationships with in seemingly endless ways.

Developers can even use generative AI to help ensure an optimal balance of challenge and fun. Generative AI can be used not only to scale game difficulty in response to individual player success—but also to continuously adjust virtually any aspect of the game in response to player feedback and data.

Redefine replay value

Generative AI can keep players coming back for more by creating an infinite variety of new experiences. For example, developers can use models to auto-generate certain game areas or entire levels based on set parameters. Generative AI can take this idea far beyond the rules-based systems of the past, offering players a truly unique experience every time they play.

Developers can also use generative AI to create new game content quickly or even automatically. This can help keep players invested through new missions or daily challenges while minimizing the burden on developers. Generative

models can even create items and reskin levels to match new themes, allowing for games that continuously expand and offer new content with speed and variety far exceeding the industry norm.

Engage every type of gamer

Studios can use generative AI to encourage new players, endlessly challenge veterans, and engage gamers of every kind.

With virtual assistants and chatbots powered by generative AI, new players gain a lifelike ally that guides them through the early stages and helps them gradually advance their skills. For veteran gamers, these features can act as resource centers where players study advanced techniques or dive deeper into the game's lore—all through a simple Q&A interface.

Studios can also use generative AI to bring more real-world experiences into their games. For example, generative AI can help replicate the excitement and simplify the logistics of tabletop role-playing games (RPGs). A lifelike AI-powered game master oversees and dynamically adapts the game's rules, storylines, and NPC interactions—delivering the adventure RPG fans crave while making the game more accessible to newcomers.

Generative AI can even be used to power advanced tools for user-generated content (UGC), which can help attract streamers, content creators, and influencers. Players can use these tools to share their experiences faster and with greater ease. Generative AI can also help remove technical knowledge barriers—such as coding, design, and animation—allowing a wider range of creators to develop new game content or mods.

Upgrade game publishing and support

Key functionalities

- Generate marketing and sales collateral, additional campaign content, and ideas for reaching new audiences
- Power community/customer-service bots and enterprise-knowledge bots

Beyond game design and development, generative AI can help optimize publishing operations to promote a studio's games, expand its audience, and provide players with a high level of support.

Accelerate ad and social campaign creation

Advertising and social campaigns often create players' first impressions of a game. Generative AI can accelerate campaign production, exponentially widen testing capabilities, and allow for highly personalized copy and imagery that engage a wide variety of audiences. Further, using a generative AI model fine-tuned to the game's visual style and substance can help marketers and artists be far more productive—and allow them to develop award-winning campaigns faster and with greater consistency.

Improve support and player self-service

Generative AI can help game developers improve the efficiency and quality of global customer care and support. Chatbots, text and voice summarization, intelligent resolution recommendations, and language translation can help support teams do their jobs more effectively—and get players back in the game faster.

For example, Electronic Arts' Worldwide Customer Experience (WWCE) organization is reimagining the player support experience with generative AI. Through **Amazon Bedrock**—a service that offers access to high-performing FMs through a single API—the team is experimenting with Amazon Titan to solve for various customer service use cases. These include automated Q&A, engagement summarization, service ticket assist, and chatbots.
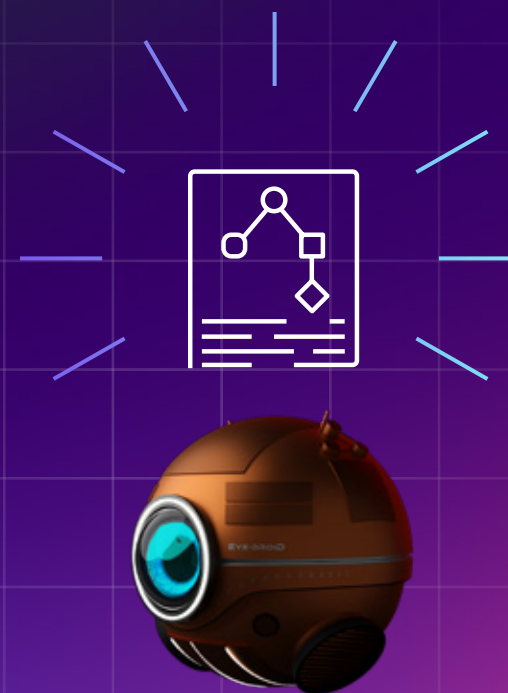
Create the right generative AI strategy

While the three application areas we have just reviewed are generally good places to start, the value of generative AI across these and other use cases will differ between developers. Factors such as budget, resources, player preferences, and a studio's unique culture and goals should all be considered in determining how and where to deploy generative AI.

Through our experience helping game studios successfully adopt generative AI, AWS has observed and developed some strategic best practices. These include:

- Start by identifying key goals, then work backwards to determine how they can be reached and what milestones that will need to be achieved along the way
- Treat generative AI as a tool that augments existing processes, tools, and people rather than replacing them
- Commit to fine-tuning and customizing models to suit the style, quality, and lore of individual games and the studio itself

Speaking broadly, the desired end state of the generative AI journey should see multiple intelligent services working in concert to complement multiple teams' capabilities. The goal is to leverage generative AI throughout the development, production, and publishing workflows in ways that accelerate and improve business outcomes.
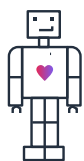
Identify ideal use cases

Determining the right generative AI use cases is critical to harnessing the full benefits of the technology. The following list of use cases can help kick-start strategic and creative thinking when exploring and experimenting with generative AI.

Generative AI use cases for game studios (by role):

Customer support

- **Chatbots/player self-service:** Provide players with intelligent chatbots that can help them quickly diagnose and resolve problems
- **Text and voice summarization:** Help customer support teams understand and communicate complex information quickly; improve support quality through post-call analytics
- **Resolution recommendations:** Equip customer support teams with advanced tools that intelligently guide them to the most effective resolution

Game developers

- **Code suggestions:** Accelerate feature and backend service development, catch security gaps, and reduce bug count using code suggestions provided by an AI assistant tuned on the studio's codebase
- **Bug detection:** Analyze code to detect possible bugs or inefficiencies and offer potential fixes

LiveOps/live services

- **Feedback analysis:** Summarize common player issues or desires by parsing and categorizing large volumes of player feedback

- **Auto-generated challenges:** Keep players engaged with daily or weekly challenges that do not burden developers

- **Chatbots/game coaches:** Support players with chatbots that can help train new players and act as resource centers for veterans through a simple Q&A interface

Marketing and sales

- **Content creation:** Generate new marketing and sales collateral that aligns with existing campaigns or strategies

- **Expand the audience:** Tailor messages to specific audiences and localize sales and marketing content for players around the world

- **Find new approaches:** Collaborate with generative AI to brainstorm new campaign ideas, content marketing topics, and sales tactics

Writers

- **Idea generation:** Generate suggested plot points, character arcs, and dialogue based on input criteria

- **Interactive storytelling:** Develop a more personalized player experience by creating consistent and logical dialogue that aligns with player choices

- **Consistency checking:** Help ensure character and thematic consistency—and even check for plot holes—by analyzing the entire script

World-builders and artists

- **Content generation:** Create concept art, game assets, and music

- **Texture and asset generation:** Easily experiment with different world art styles and dynamically adapt textures to game context

- **Style transfer:** Apply art styles from one image to another; for example, converting an unrelated photo to match the game's art style

- **Animation:** Quickly produce base animation sets and adapt them to each character's style

Transform the future of gaming with generative AI on AWS

AWS can help game studios unleash the power of generative AI today. With generative AI on AWS, studios can:

1. Easily build and scale generative AI applications

Access and customize a powerful range of FMs with Amazon Bedrock, a scalable, reliable, and secure AWS managed service. Amazon Bedrock includes advanced **privacy and security** features that help protect intellectual property (IP) and sensitive information—so developers can **integrate their own data with confidence**.

2. Control costs while maximizing performance

AWS delivers the **most price-performant infrastructure for ML**. Over the last five years, we have invested in our own silicon to push the envelope on cost-efficiency and performance for demanding ML workloads.

3. Moderate player prompts and outputs

AWS offers built-in solutions that can help prevent players from contorting generative AI applications into producing content that violates community standards or legal regulations. Amazon Bedrock includes a moderation layer that flags objectionable prompts and outputs. Developers can use AWS reference architectures to build custom protection content moderation layers with **Amazon Rekognition**, **Amazon Transcribe**, **Amazon Comprehend**, and other services.

4. Spend more time innovating and differentiating

AWS services empower developers with greater capabilities and more time to build. In a productivity challenge conducted by Amazon, developers who used **Amazon CodeWhisperer**—an AI coding companion that **generates code suggestions in real time**—were **27 percent more likely to successfully complete tasks** and did so **57 percent faster** on average than those who did not use CodeWhisperer. Finally, with **Amazon QuickSight**, game teams can share ML-powered business insights to **speed up and improve decision making**.

5. Enjoy flexibility and scalability

Take generative AI solutions even further with **Amazon SageMaker JumpStart**, an ML hub where developers can **discover, explore, and deploy a broad range of FMs**. AWS is continuously adding more models so studios can continue enjoying a wide range of options for years to come.

6. Maintain privacy and security

When studios customize FMs with their own data on Amazon Bedrock, the service makes a separate copy of the base FM that is accessible only by that studio. Further, **the studio's data is not used** to train the original base models. Amazon Bedrock also encrypts data in transit and at rest, supports identity and access management (IAM), and is in scope for many common compliance standards.

7. Leverage cloud services purpose-built for game developers

AWS for Games offers purpose-built game development capabilities to **help studios build, run, and grow their games**. Explore solutions for cloud game development, game servers, game security, LiveOps, game analytics, AI, and ML. Plus, accelerate deployment support with over 290 game development partners.

Addressing key questions with AWS

Studios are demonstrating the value of generative AI for games today—while also discovering the technology's enormous potential for tomorrow. As with any technology, however, harnessing the benefits of generative AI requires careful planning and strategies for overcoming key challenges.

Here are some questions to consider along the journey—and some ideas on how AWS can help address them:

How will IP be kept private?

AWS offers many **privacy and security** features that can help protect confidential and sensitive data as studios leverage generative AI. For example, Amazon Bedrock allows developers to **privately fine-tune FMs** from a broad range of industry-leading providers with their studio's data. To help keep IP safe, the service makes a separate copy of the base FM that is accessible only by that studio, and the studio's data is not used to train the original base models. Further, Amazon Bedrock encrypts data in transit and at rest, supports IAM, and is in scope for many common compliance standards.

How will player-generated content be moderated?

AWS provides multiple services and solutions for efficiently moderating UGC across text, images, audio, and video. Amazon Bedrock offers **content**

moderation capabilities today, and **Guardrails for Amazon Bedrock** (in preview at the time of this eBook's publication) **detects and blocks user inputs and FM responses** that fall into restricted topics that our customers define. Developers can also use **Amazon Rekognition Content Moderation**, which can **efficiently review millions of images and videos and automatically flag up to 95 percent of content** that violates predefined or business-specific rules.

See this **guidance from the AWS Solutions Library** for additional ideas and information.

How will the cost of operating generative AI applications at scale be managed?

AWS can help studios maintain the right balance of performance and cost. For all types of workloads, **AWS Auto Scaling** monitors the customer's applications and automatically adjusts capacity to **maintain steady, predictable performance at the lowest possible cost**. For AI and generative AI workloads, **Amazon Elastic Compute Cloud** (Amazon EC2) instances featuring **AWS Trainium** accelerate model training time while **reducing training costs by up to 50 percent**. And Amazon EC2 instances with **AWS Inferentia** deliver up to **2.3 times higher throughput** and up to **70 percent lower cost** per inference.[1]

[1] Compared to similar Amazon EC2 instances

CONCLUSION

Next steps

Generative AI can help transform game studios, empowering them to disrupt the industry and build great games faster. With AI tools evolving at a rapid pace and new game-specific use cases emerging on a seemingly daily basis, the time for adoption is now.

By exploring generative AI today, game studios can shape the technology's role within the industry. They can lead the way in satisfying players' hunger for new experiences with a new wave of innovative gameplay mechanics and features that set their games apart. And studios can deliver these differentiating capabilities at speeds and with degrees of variety unlike anything the industry has ever seen.

AWS can help game developers realize these benefits by executing the right generative AI strategy—one that combines the right tools and infrastructure to **accelerate game development, revolutionize player experiences, and expand the game's audience on a global scale**.

Further, AWS is invested in the long-term evolution and success of generative AI. In our experience **helping more than 100,000 organizations leverage AI**, we've developed five tips that can help studios achieve their generative AI goals today—and **stay on the bleeding edge of game innovation** for years to come.

Learn more about generative AI on AWS ›

Explore AWS for Games ›

Discover Dynamic Game Content Generation solutions on AWS ›

Questions? Get in touch with an AWS for Games expert ›

Tips for long-term success with generative AI

1. **Integrate generative AI with existing tools and workflows.** The most successful adoptions are ones that augment—not replace—their operations with generative AI.

2. **Foster a culture of innovation.** Encourage teams to try different FMs, experiment with new use cases, continuously fine-tune their models, and remain curious as they develop their generative AI skills.

3. **Always prepare and cleanse data before training models.** Cleansing training data of errors—such as incomplete or inaccurate data fields, duplicate information, unrelated data, and incorrect formatting—can help ensure that generative models produce accurate predictions and results.

4. **Stay future-ready.** Generative AI technologies are rapidly evolving, so be ready to migrate models as new ones become available.

5. **Start small and scale successes.** Experiment with various use cases to find the right ones for the game, infrastructure, budget, and resources. Once the value of a use case has been proven locally, leverage AWS to deploy and scale it around the globe.