

IoT-driven image processing in hybrid cloud environments for real-time scalability and insights

Integrate IoT into hybrid cloud environments to enable efficient image processing, and deliver scalable and real-time solutions for diverse industry applications, backed by Vultr Cloud GPU with Console Connect Edge SIM for secure, private IoT connectivity, and Gravio's IoT data integration and orchestration platform for edge devices to simplify management.

C consoleconnect

VULTR

- Gravio

Hybrid cloud connectivity for IoT image processing

Image processing, powered by IoT in hybrid cloud environments, enables real-time data analysis and scalability through integrated connectivity, edge orchestration, and cloud GPUs.

Combining IoT connectivity with advanced image processing improves enterprise operations by enabling efficient data collection and analysis. A hybrid cloud approach allows sensitive IoT data to be analyzed securely onpremises while utilizing cloud platforms' scalability and computational power for advanced machine learning tasks. The large volumes of visual data gathered from cameras and sensors at the edge can be processed locally for low-latency applications using edge orchestration and routed to cloud GPUs for deep analytics and AI model training. This integration enhances efficiency and streamlines workflows.

Vultr partners with Console Connect for secure IoT data transfer and Gravio for no-code local data processing, enabling GPU-powered real-time insights, operational efficiency, and scalable AI across hybrid cloud environments.

Key challenges and solutions

Managing high volumes of visual data

IoT devices generate large amounts of data from cameras and sensors at the edge, but transmitting it all to the cloud can strain networks, cause latency issues, and increase costs, limiting real-time processing capabilities and posing security risks.

The solution is edge computing, which transmits data isolated from the public internet and processes it as if on a local LAN network. Console Connect ensures secure, low-latency data transfer through its global network of private GSM connectivity using Console Connect Edge SIMs. Gravio's no-code edge platform streamlines local processing on Vultr Cloud GPUs without relying on public internet infrastructure, minimizing dependency.

Data security and privacy

IoT image data often contains sensitive or regulated information, requiring secure handling to meet compliance standards. Transferring all data through the public internet to public clouds, even if encrypted via VPNs, raises privacy concerns.

A hybrid cloud approach addresses this by processing sensitive data locally and leveraging cloud scalability. Vultr supports secure hybrid deployments, Console Connect provides data transfer through dedicated networks, and Gravio ensures compliant edge processing on the application layer.

Scaling AI workloads for real-time analysis

Al workloads for image processing, particularly real-time applications, demand significant computational power. Enterprises often struggle to scale efficiently while maintaining performance and controlling costs.

Vultr Cloud GPUs deliver scalable AI compute, Console Connect ensures reliable connectivity for real-time data flow, and Gravio provides the application layer and optimizes resource allocation through edge orchestration.

Integration costs and complexity

Integrating IoT devices with cloud platforms for image processing can be costly and technically complex, requiring secure networks, edge computing solutions, and seamless interoperability between devices and systems.

Vultr's predictable pricing ensures cost-effective scalability for AI workloads, Console Connect's Edge SIM offers secure IoT connectivity without costly infrastructure changes, and Gravio's no-code platform simplifies integration and edge processing, minimizing integration expenses.

IoT-Driven image processing



IoT-Driven image processing sample application

Console Connect's Edge SIM and private layer 3 network ensures secure, low-latency data transfer from IoT devices to Vultr cloud. Gravio's no-code edge orchestration enables local data processing, while Vultr Bare Metal GPUs power advanced analytics and AI model training, enabling efficient hybrid cloud integration for real-time insights.

Inside the demo: setup and key components

In this setup illustrated above, an IoT device (iPad) equipped with a Console Connect Edge SIM captures a large volume of image data for processing. The Edge SIM assigns the device a private IP address, ensuring secure communication. The data is transmitted over a mobile network directly into the Console Connect private network, leveraging a CloudRouter to bypass the public internet. This ensures secure, low-latency data transfer to the Vultr cloud infrastructure.

A high-performance Vultr Bare Metal GPU hosting the AI Large Language Model (LLM) and Gravio application receives and processes the data using Visual Questions Answering (VQA) techniques. This GPU-powered server, with 72 cores, more than 480 GB of RAM, and over 4 TB of NVMe storage, provides the computational capacity to handle large language models efficiently. At the application layer, Gravio receives the visual data, transforms and pushes it to the local LLM alongside AI prompts, and handles the respective replies from the Al. In this process, called "Visual Questions Answering," the Al sends image data alongside prompts to receive answers in machine-readable data. Gravio also enables real-time insights, ensuring scalable analytics for enterprise applications, and connects to other APIs such as databases, notification centers, or process optimization platforms. This architecture integrates IoT, private networks, and cloud GPUs for secure, efficient hybrid cloud solutions without relying on the public internet.

Why this is important

This IoT-driven image processing solution produces significant value for businesses by enabling secure, realtime data processing with AI privately and at scale. While APIs from OpenAI or Amazon provide VQA, customers must pay per use, which can quickly become costly.

A dedicated Vultr server circumvents these costs with predictable pricing and empowers enterprises to handle large volumes of IoT-generated data efficiently, ensuring rapid insights and improved decision-making.

This setup reduces latency, enhances data security, and supports scalable analytics by leveraging private networks and hybrid cloud infrastructure. It empowers businesses to optimize operations and gain a competitive edge in data-intensive industries.

Demo applications across industries

Financial services: An insurance company deploys IoT-enabled cameras and sensors on roadside assistance vehicles to capture realtime visual data, such as accident photos. Gravio's edge computing processes the data on-site for immediate legal causality analysis, determining the sequence of events and liability. The data is then transferred via Console Connect's secure private networking to Vultr's cloud servers. Vultr Serverless Inference, powered by GPUs, analyzes historical patterns to detect fraudulent claims and ensure policy adherence while maintaining compliance with privacy standards.

Healthcare and life sciences: A hospital deploys IoT-enabled devices to analyze patient X-rays for early disease detection. Gravio's edge platform processes data locally to ensure privacy compliance, while Vultr Serverless Inference and cloud GPUs handle advanced analytics on large datasets, enabling faster and more accurate diagnoses. Console Connect ensures secure transmission of sensitive medical data between edge devices and the cloud.

Manufacturing and energy: Connected drones equipped with cameras and sensors capture real-time images and videos of oil fields and refinery infrastructure. Gravio orchestrates the processing of sensor and visual data locally, ensuring anomaly detection. The data is securely transmitted via Console Connect's EDGE SIM infrastructure to a private Vultr server. Vultr's high-performance cloud infrastructure supports AI and VQA workflows, providing insights, detecting trends, and triggering alerts to ensure operational safety and efficiency.

Media, entertainment, and gaming: A live-streaming platform employs IoT-connected video monitoring tools to analyze real-time user uploads. Edge processing filters explicit or flagged content locally to prevent delays, while Vultr Cloud GPUs update moderation algorithms with machine learning to enhance accuracy. Console Connect ensures fast, secure data transmission between edge devices and the moderation team's centralized dashboard.

Telecommunication: A telecom company uses IoT cameras and drones (air and underwater drones) to inspect remote towers and undersea cables, detecting equipment wear for proactive repairs. Gravio's edge platform processes data locally for immediate issue identification, while Vultr provides cloud infrastructure and GPU power to analyze historical image data and optimize maintenance schedules. Console Connect ensures secure data flow between inspection sites and central systems.

Retail: A retail chain uses IoT-connected stockroom cameras to capture visual shelf-level data, enabling precise inventory monitoring and theft detection. Gravio's edge orchestration processes data locally for immediate low-stock alerts and securely uses Console Connect's private networking to link data to Vultr's high-performance cloud infrastructure. There, Al-driven tools analyze sales data and trends, supporting efficient inventory operations through centralized management systems. Vultr, Gravio, and Console Connect integrate to deliver secure, no-code IoT data processing across industries



Further resources



Check our help docs on Al Image Manipulation, and read our datasheet on Hybrid Cloud Architecture for IoT.

- How to Use Meta Llama 3 Large Language Model on Vultr Cloud GPU →
- How to Deploy Large Language Models on Vultr Cloud GPU using OpenLLM→

Contact us at vultr.com to get started.