# Emulator for a Micro-Fulfillment ASRS System

## Executive Summary

Alert Innovation was founded in 2013 and in the span of a few short years developed a cutting-edge Micro-Fulfilment system called Alphabot®.

Micro-fulfillment is an automated, robotic, order fulfillment system with high storage density and high throughput, designed to fulfill orders within one hour. The density of the design allows them to fit into small footprint locations closer to the consumer, ideal for retail companies.

Alert asked VividCloud to join their team as the company transitioned the focus of Alphabot development from the initial engineering of the system, into creating a resilient, reliable, and scalable release-ready product.

## Client's Key Challenges

An emulator is a critical part of the development and testing of any Automated Storage Automated Retrieval System (ASRS). The emulator facilitates the testing of the robot fleet management software and other components of a Warehouse Control System (WCS). Emulation and simulation technology is superior way to test complex, algorithm heavy, production software, without the expense of doing so in a lab – or much worse – at a production site.

Alert's emulator required a significant number of enhancements to allow more thorough and comprehensive testing of the Alphabot system in preparation for production environments. VividCloud was asked to help.

Alert had four challenges with their emulation software:

- They needed a dedicated team to focus on the emulator. As non-production software, the emulator had not received the dedicated effort required to produce a fully capable tool. However, Alert understood that a highly capable emulator was critical to their ability to deliver the number of production installations required.
- They also needed the ability to create emulation scenarios and execute them automatically. At the time, emulation runs could only be executed manually through a GUI. There was no automation or scripting available.
- There were many issues with emulator performance and reliability due to multiple and inconsistent environments the software was running within.
- Lastly, users could only run a single emulation test at a time, which had become a major bottleneck to testing.

**Industry:** **Warehouse Automation**

**Location:** **Andover, MA**

**Website**

**www.alertinnovation.com**

About

ALERT INNOVATIONS

**Alert Innovation is a leader in e-Grocery technology based on its breakthrough Alphabot® platform.**

**Alphabot® is a superior Micro-Fulfillment Center (MFC) technology that enables grocers to profitably support online ordering today.**

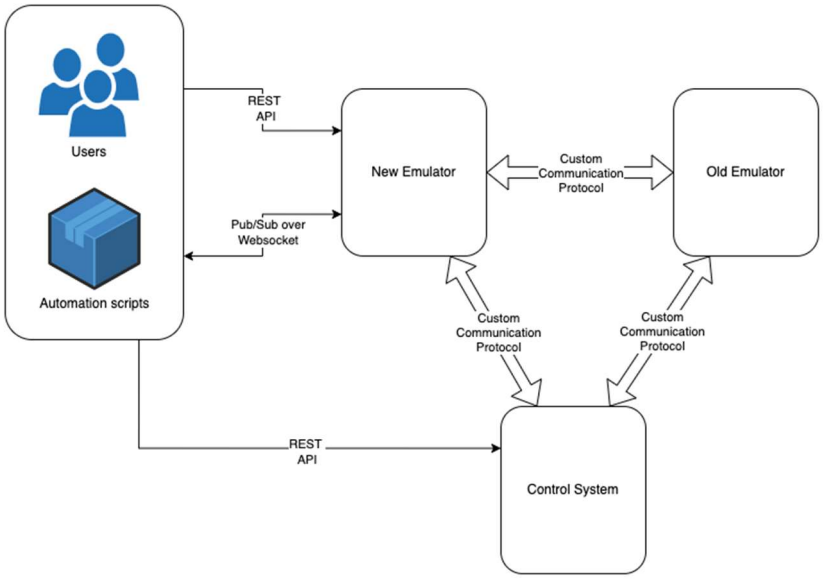
**Alphabot® powers Walmart's first MFC system, located in Salem, NH.**

**Founded in 2013 by John Lert and Bill Fosnight, the company was acquired by Walmart in 2022.**

## VividCloud's Solution

VividCloud deployed a dedicated team to Alert and architected a new cloud-based, containerized solution for the emulator that is much more flexible, scalable, and delivers a consistent configuration of the execution environment, The project was implemented in three phases.

In Phase 1 of the project, the new emulator exposed a REST API allowing control of all emulation functionality, while emulation events and state changes were streamed over a message broker. The new emulator acted as a proxy to the old emulator – with all emulation logic still living in the old system. The new software communicated via custom TCP protocol to the old software in order to control the emulation runs. At this point VividCloud deployed a second team of developers to write automated scenarios/test cases against the emulation system.

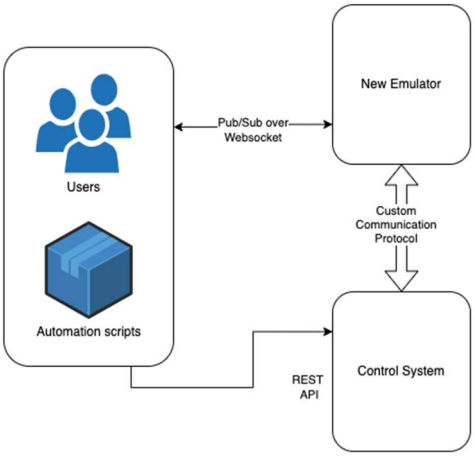



**INTERIM SOLUTION ARCHITECTURE**

In Phase 2, VividCloud began taking emulation functionality out of the old system and moving it to the new system. This was done piece-by-piece, which allowed VividCloud to test and verify that the results of the new software matched the old. This process was transparent to the end users of the emulator. This phase concluded once 100% of the emulation logic was implemented and operational entirely within the new system.

In Phase 3 of the project, VividCloud migrated the emulator to the Azure cloud platform. All services run in Docker containers on a Kubernetes cluster. Emulation runs can be spun up and taken down with ease. Multiple users can each execute multiple emulation scenarios simultaneously.

In Phase 4, VividCloud integrated the 'library' of automated emulation scenarios and tests into a CI/CD pipeline for deployment of the production software.




**FINAL SOLUTION ARCHITECTURE**

## Results and Benefits

Alert Innovation, in their partnership with VividCloud, overcame the challenges and limitations they faced with the original emulator. The new cloud-based, containerized, emulator allows Alert to validate new builds of production software faster and more reliably, finding bugs before they make it into a production system. The new emulator significantly reduced the amount of manual testing required.

Alert now:

- Runs emulation tests and scenarios in an automated fashion.
- Has emulation environments that are uniform and stable, dramatically increasing the number of bugs caught and decreasing the number of false bugs reported.
- Runs emulation tests and scenarios in CI/CD pipelines to validate production software quality and performance.
- Aggregates data across different emulation runs to spot trends and/or potential performance bottlenecks.
- Has an emulation platform that is extensible ongoing and future development initiatives.

VividCloud delivered the solution to the client on-budget and ahead of schedule.

**About VividCloud**

VividCloud is a software development company focused on cloud and IoT. AWS is our cloud platform of choice, and we are an Advanced Tier APN Consulting Partner. We bring fully managed teams that free our clients from day-to-day oversight responsibilities. VividCloud is based in Brunswick Maine, with 100% of our people onshore in the US.

VIVID CLOUD
smarter software. engineered here.