PURDUE UNIVERSITY
School Of Applied
And Creative Computing

SERVERLESS BUSINESS OPERATIONS AND ANALYTICS PLATFORM

OVERVIEW

This project was completed in Spring 2025 for CIT 50100 – Data-Driven Cloud Applications, a graduate course focused on designing and deploying serverless systems on Google Cloud Platform (GCP). Our team built SmartStock, a lightweight inventory management and analytics platform that automates order processing, stock updates, and restock alerts for small businesses.

SmartStock integrates App Engine, Firestore, BigQuery, Pub/Sub, and Cloud Functions to form an event-driven workflow with SendGrid and the Google Maps API for notifications and geocoding.

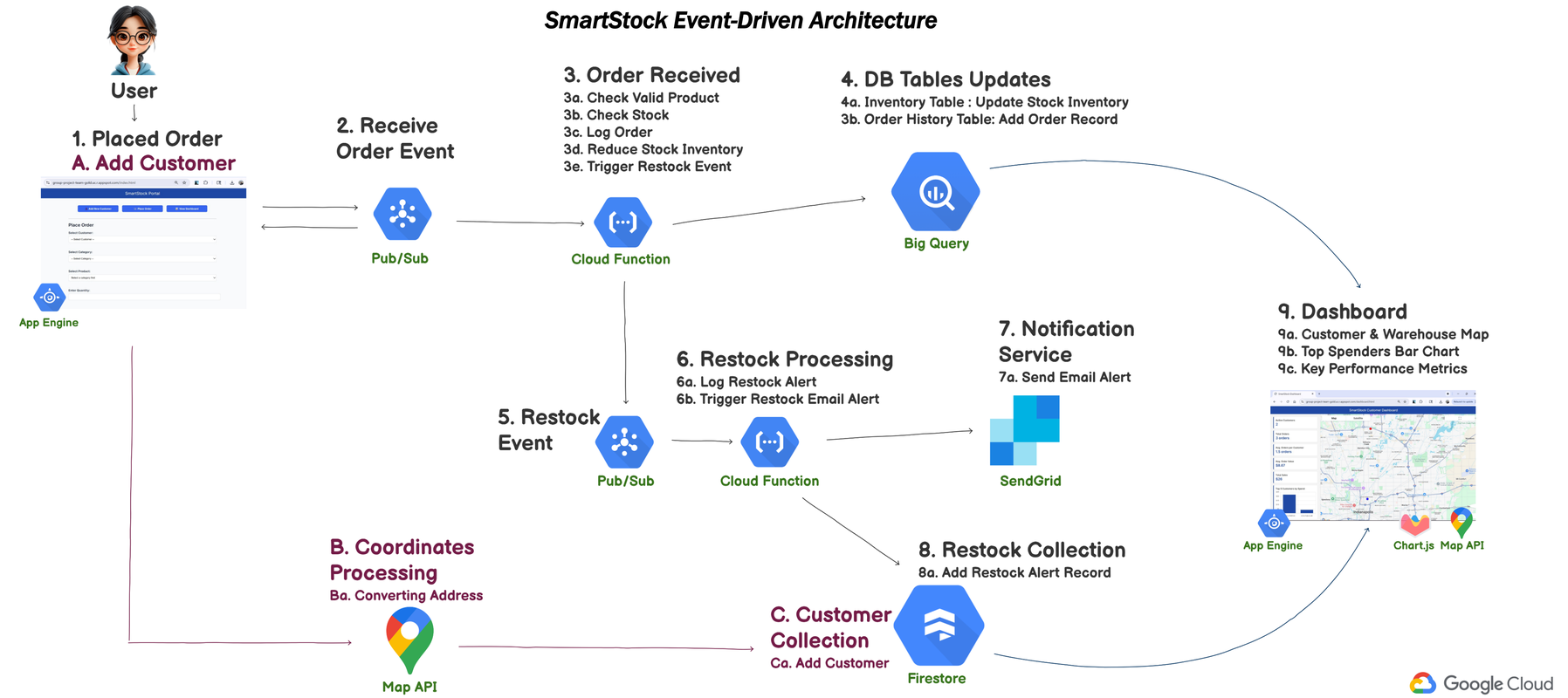

Figure 1. Workflow illustrating event-driven automation across App Engine, Pub/Sub, Cloud Functions, BigQuery, and Firestore.

TECH STACK

Component	Technology
Frontend	HTML + CSS + Express (AppEngine)
Backend	Node.js (Cloud Functions & Express)
Database	BigQuery (Inventory + Orders)
NoSQL	Firestore (Customers + Alerts)
Messaging	Pub/Sub
Email	SendGrid API
Mapping	Google Maps JavaScript API
Geocoding	Google Maps Geocoding API
Visualization	Chart.js

FUTURE WORK

- Customer self-service ordering portal
- Automated restocking integration
- Enhanced dashboards (Sales & Inventory)
- Supplier management
- Access & Security

CONCLUSIONS

- Fully functional, deployed system with real-time automation
- 100% serverless design
- Strengthened understanding of event-driven architecture & cross-service integration

SUMMARY

1. **Order Placement:** User adds customer or places an order through App Engine.
2. **Processing:** Pub/Sub triggers Cloud Functions to create order & update stock in BigQuery tables.
3. **Restock Alerts**: Firestore logs alerts and SendGrid emails notifications.
4. **Insights:** Dashboard displays live analytics with Chart.js. & Map API

SmartStock enables full automation from order placement to insight generation.

CONTRIBUTORS: Anna Bajszczak, Mehul Thawre, Glen Allman

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Project Demo