

*AI Solutions for an Intelligent Planet*

# **ReSite – Architecture Diagrams**

## *Week 2*

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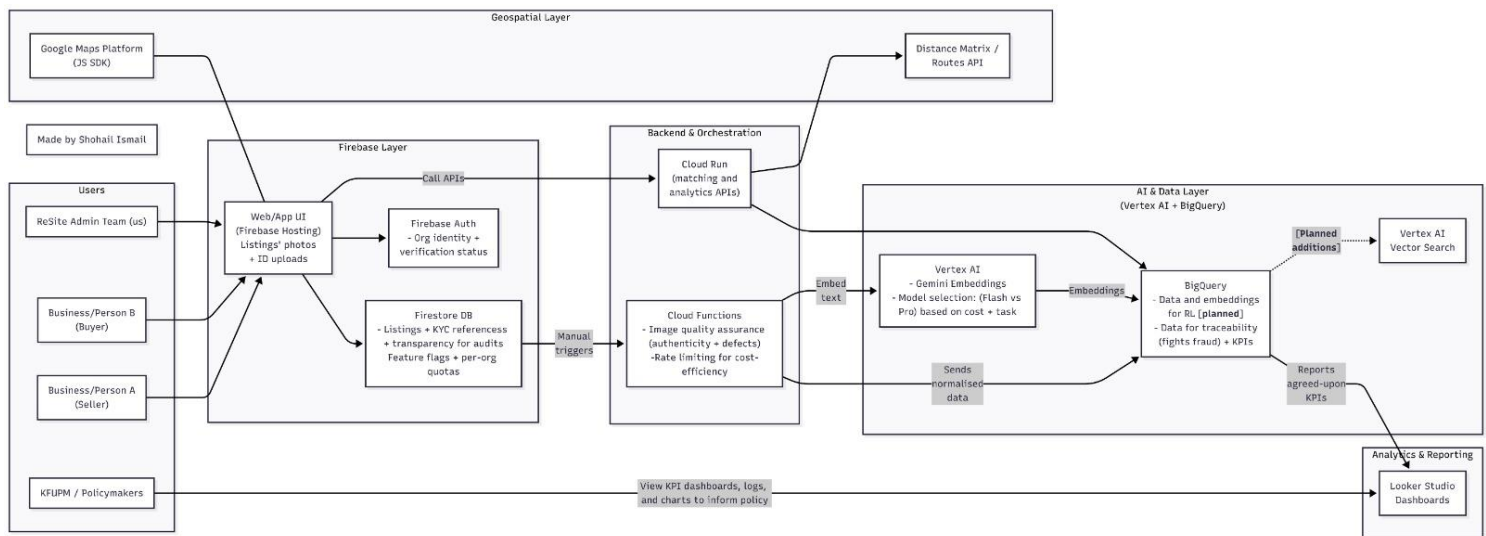
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# Table of Contents

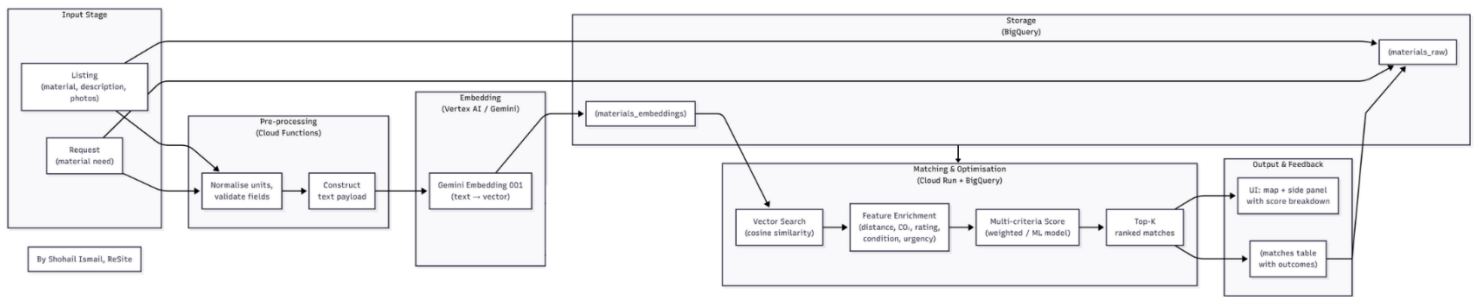
<b>Systems Architecture Diagram .....</b>	<b>3</b>
<b>AI/Data Flow Architecture Diagram .....</b>	<b>4</b>
<b>Parameters Impacting the Optimisation Algorithm .....</b>	<b>5</b>
<b>Quality Assurance and Legal Responsibility .....</b>	<b>6</b>

## Systems Architecture Diagram



**Systems Architecture Diagram** illustrates ReSite’s full system topology across Google Cloud. The Firebase layer with Hosting, Firestore, and Auth supports the public web app, secure onboarding, and real-time listing management. Event-driven Cloud Functions orchestrate backend processing, while Cloud Run exposes scalable APIs for matching and analytics. Vertex AI provides material-understanding via Gemini embeddings, and BigQuery stores raw listings, vectors, match outputs, and KPIs. Geospatial intelligence comes from Google Maps Platform, enabling routing, distance, and CO<sub>2</sub> estimation. Finally, Looker Studio dashboards surface sustainability impacts to KFUPM, ensuring the stack remains visible, reproducible, and enterprise-grade.

## AI/Data Flow Architecture Diagram



**AI/Data Flow Architecture Diagram** shows the end-to-end AI and data pipeline for matching.

- A Firestore listing triggers Cloud Functions to normalise attributes and send structured text to Vertex AI's Gemini Embedding model, producing a semantic vector.
- Both the raw payload and embedding are persisted in BigQuery.
- Matching begins with cosine-similarity retrieval of top-K candidates, followed by enrichment with distance, ETA, and logistics emissions from Google Maps APIs.
- Cloud Run optimisation service then computes a weighted score combining the metrics discussed (combining semantic similarity, transport cost, condition score, urgency, supplier reputation, and CO<sub>2</sub> savings) for final top matches.
- The final ranked matches feed the frontend (map visualisation through the Maps JavaScript SDK, and key KPIs (tonnes reused, CO<sub>2</sub> avoided, distance saved) feed directly into BigQuery and Looker Studio dashboards for KFUPM and policymakers)

## **Parameters Impacting the Optimisation Algorithm**

### Which ones?

Time of travel, Weather(precipitation, humidity, heat), Storage Availability, Demand/Supply Habits, Supplier Ratings, Transport Cost/Type of Transport, Route Restrictions dependent on Load, Material Condition Score, Quantity, Lead Time on Procurement Before Transport, Remaining Shelf Life(?), URGENCY/PRIORITY LEVEL(POSSIBLE TIERED SUBSCRIPTION), ESG parameters for responsible CSR companies.

### How are we going to show optimisation?

- Google Maps, but how? Weather has a useable API
- Map view: show two or three candidate matches for the same material.
- Side panel: show a score breakdown for each candidate
- (distance, ETA, cost estimate, CO<sub>2</sub> saving, supplier rating).
- Highlight which match your optimisation picked and why
  - (I.e. “Option B is slightly further but verified supplier + better condition + higher CO<sub>2</sub> saving → higher total score”).

## **Quality Assurance and Legal Responsibility**

### How will we ensure that we protect buyers?

- <https://faisalkhan.com/knowledge-center/payments-wiki/l/what-is-light-kyc>
  - Verified business onboarding (KYC-lite)
- Mandatory photos + specification fields
- Dispute resolution workflow stored in Firestore
- AI-assisted moderation (Gemini used to detect inappropriate images/text and flag suspicious listings?).
  - “Verified Listing” badge option

### How will we ensure that we protect sellers?

- Buyer cannot misuse specification data
- Cancellation window and return rules
- Protection from fraudulent claims via timestamped transaction logs

### How will we protect the ourselves/business?

- Standard legal frameworks at different tiers parties can opt into (base level exists to protect us)

### How do we ensure our standards are maintained?

- ISO 9001 (Quality Management Systems)
- ISO 14001 (Environmental Management)
- BS 8895 (Circular Economy in Construction)
- EN 15804 (Construction Product Environmental Data)
- Arch diagrams outline ReSite’s governance and assurance frameworks. Business onboarding uses barebones ID stored in Firestore, with verification managed by ReSite operations. Each listing and update triggers Gemini-powered safety checks for text and images, with flags written to a moderation queue (human or HITL-AI moderation?). Every transaction, negotiation (feature + selling point AKA Construction Vinted?), and dispute produces an immutable audit log in BigQuery (admin privileges discussion), supporting traceability and legal defensibility. Firestore stores dispute workflows, while BigQuery aggregates compliance and outcome metrics. Aligns with Ram's stated standards: ISO 14001, BS 8895, and EN 15804 -> so ensured accountability for buyers, sellers, and ReSite itself.