Cloud Architecture For Hawk Eye Drone Consultancy

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Introduction

Hawkeye Drone Consultancy delivers cutting-edge agricultural intelligence. We utilize drone imagery, IoT sensor data, and AI-driven analytics. Our solutions enable farmers to optimize productivity and make data-driven decisions. We help monitor crop health with precision.

Objectives

Our objectives are to build a scalable data infrastructure for drone-based consultancy. We aim to integrate multiple data sources into a unified platform. Finally, we provide real-time and historical analytics for actionable insights.

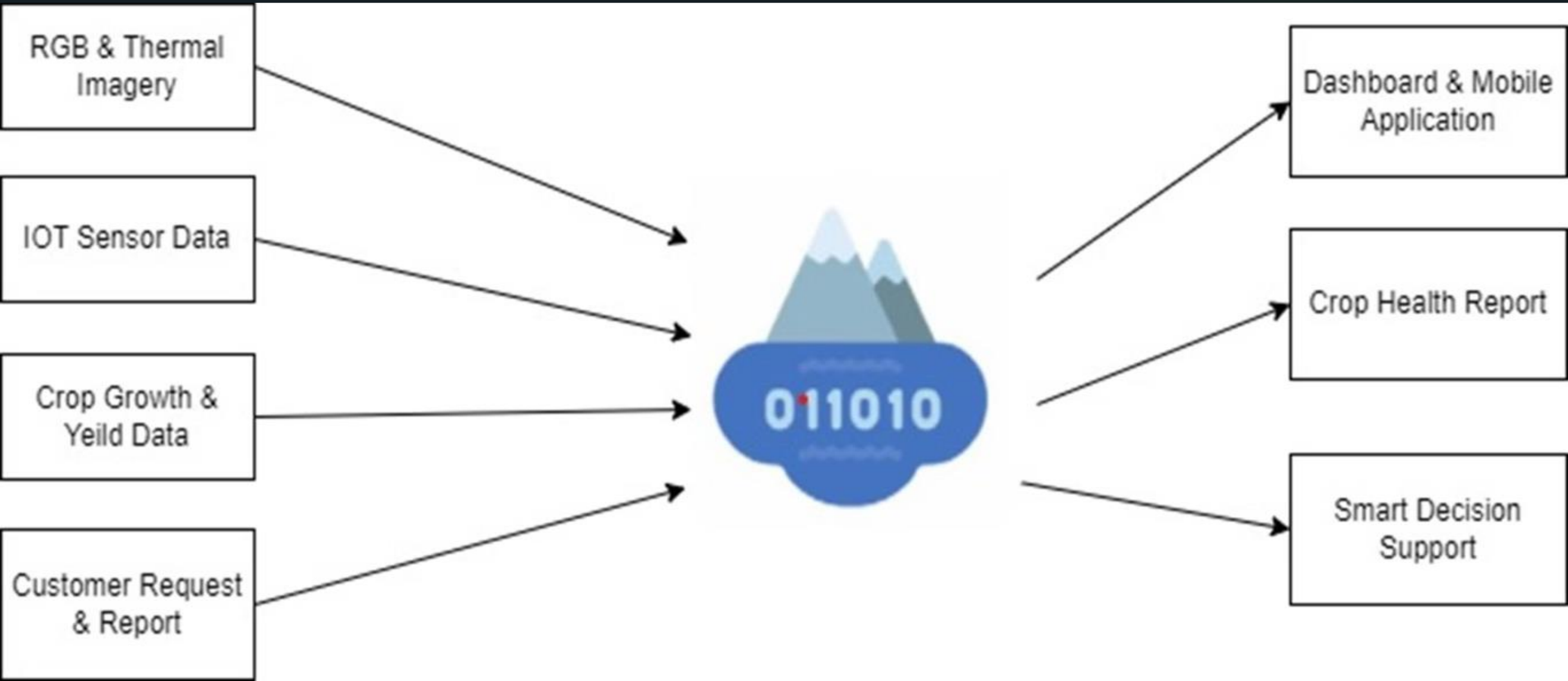
Purpose

- **Centralize & Integrate:** Streamline drone imagery and sensor data.
- **Automate Data Processing:** Enhance efficiency and reduce errors with AI.
- **Enable Advanced Analytics:** Provide predictive insights for decisions.
- **Enhance Productivity:** Support farming through real-time monitoring.

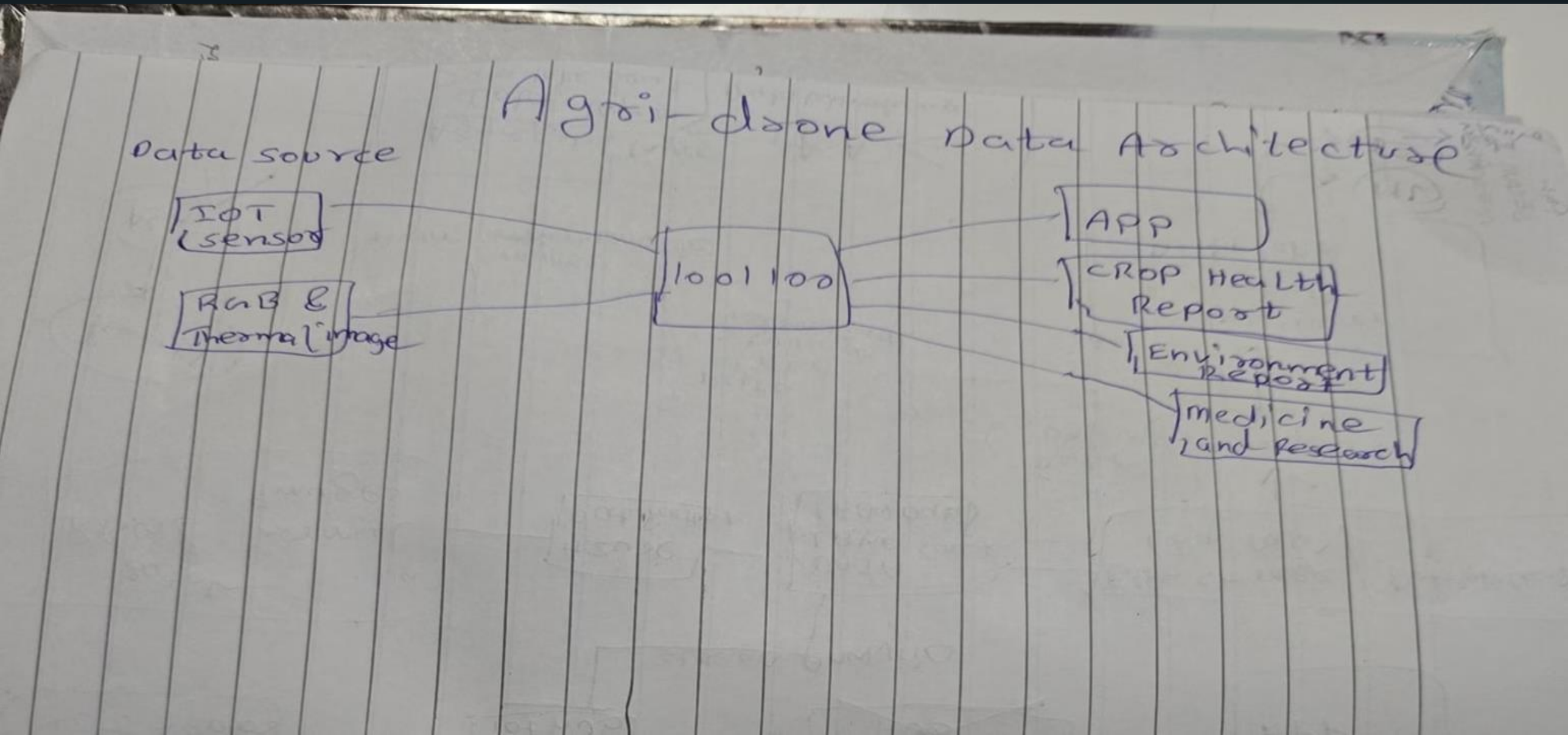
Mission

Our mission is to deliver high-quality, AI-driven agricultural insights. We empower farmers and agribusinesses to enhance productivity and sustainability. This is achieved through drone and sensor-based analytics.

Design and Discovery Phase



Final Design and Discovery Phase



Data Sources: RGB & Thermal Imagery

Type of Data: Image (Visual and Infrared Spectrum).

Examples: RGB images (canopy coverage, weed detection), Thermal images (heat spots).

Data Flow: Batch ingestion after drone missions.

Source: Agricultural drones with RGB and thermal sensors.

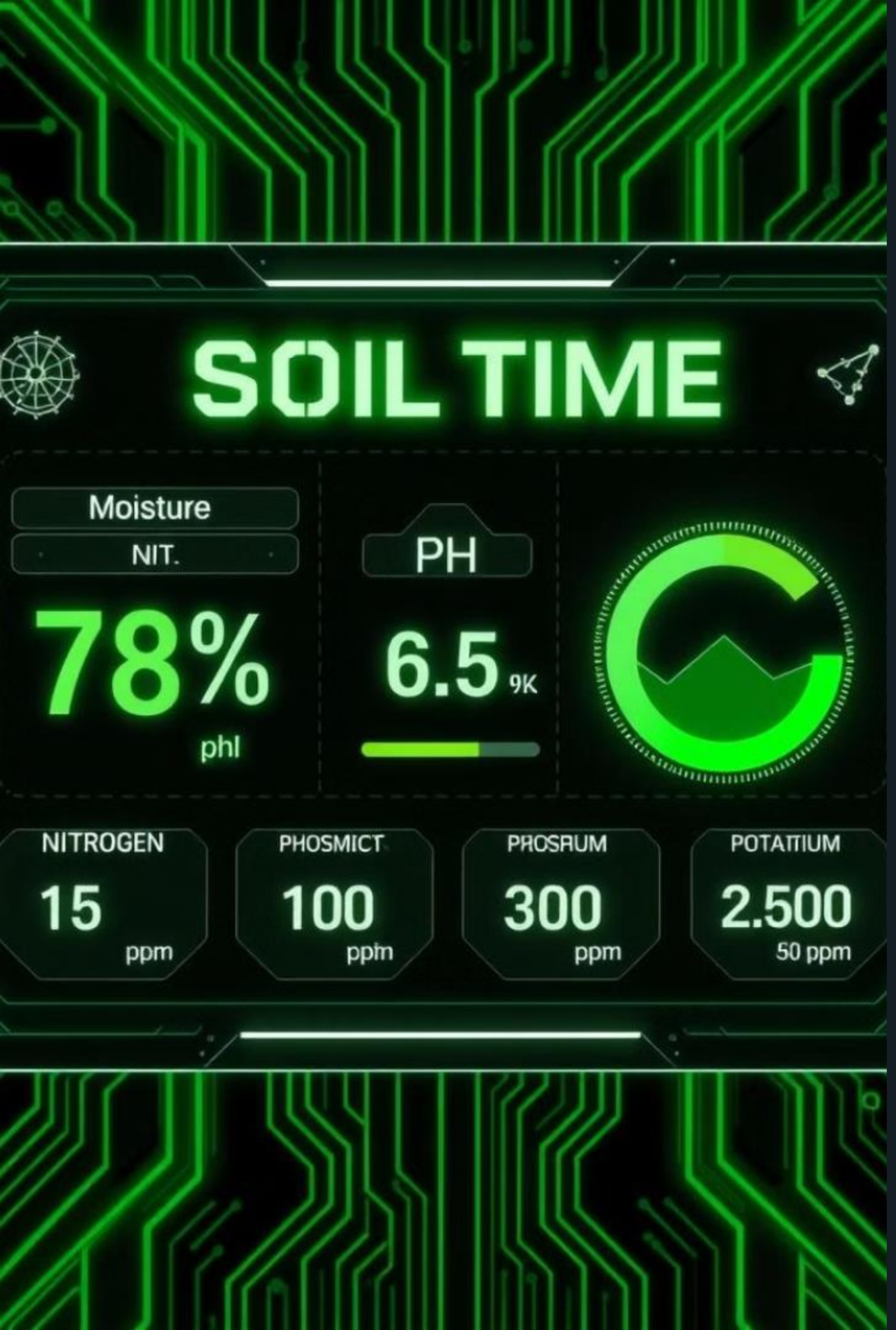
Data Source: IoT Sensors (Soil Monitoring)

Type of Data: Numeric.

Examples: Soil moisture (%), pH levels, Nutrient levels (NPK).

Data Flow: Streaming (real-time updates).

Source: IoT sensors installed on the farm.



Key Deliverables

- **App:** Live soil data (moisture, pH, NPK).

  Delivery: Real-time via mobile/web app.

- **Environment Report:** Soil trends, conditions.

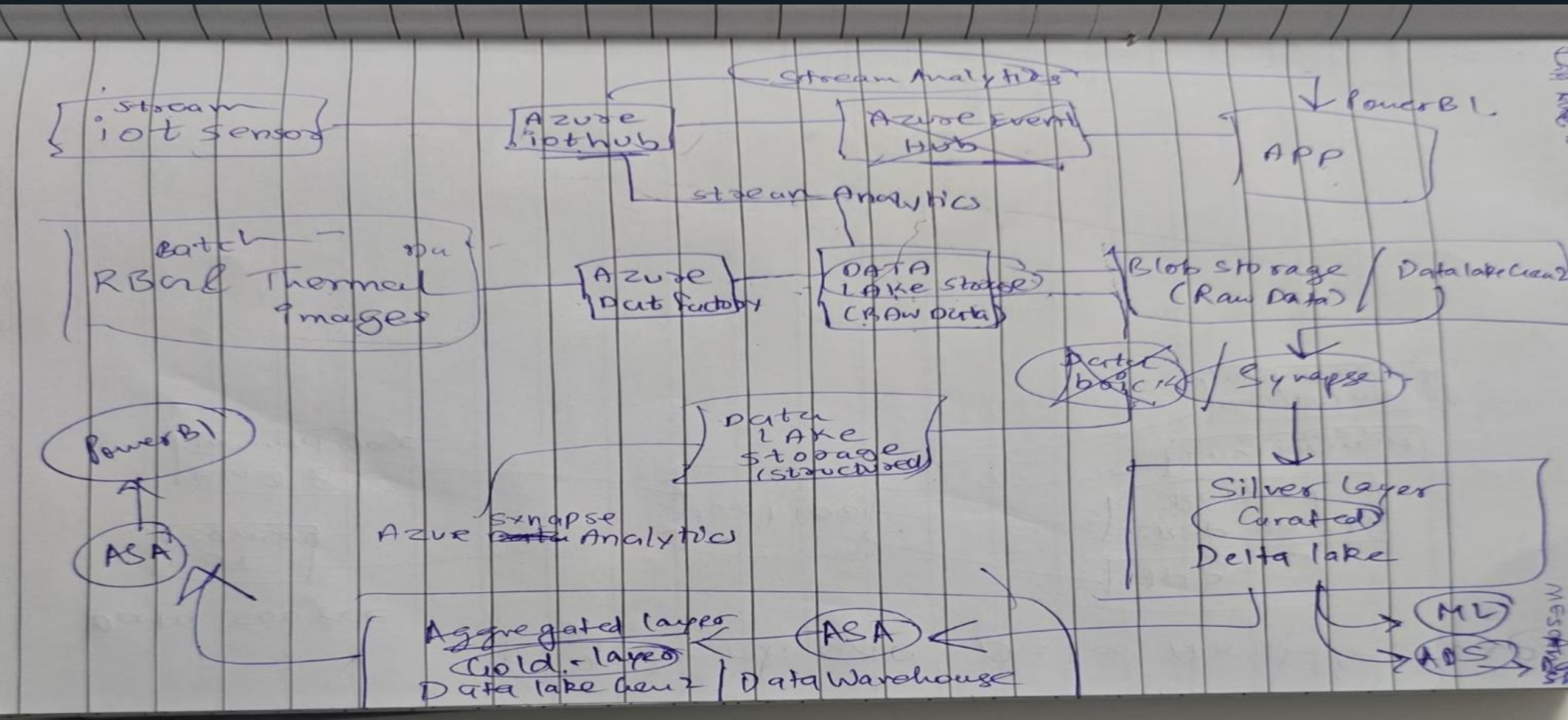
  Delivery: Periodic report via email/cloud.

- **Crop Health Report:** NDVI, stress zones, pest/disease.
  Delivery: PDF/web report after drone missions.

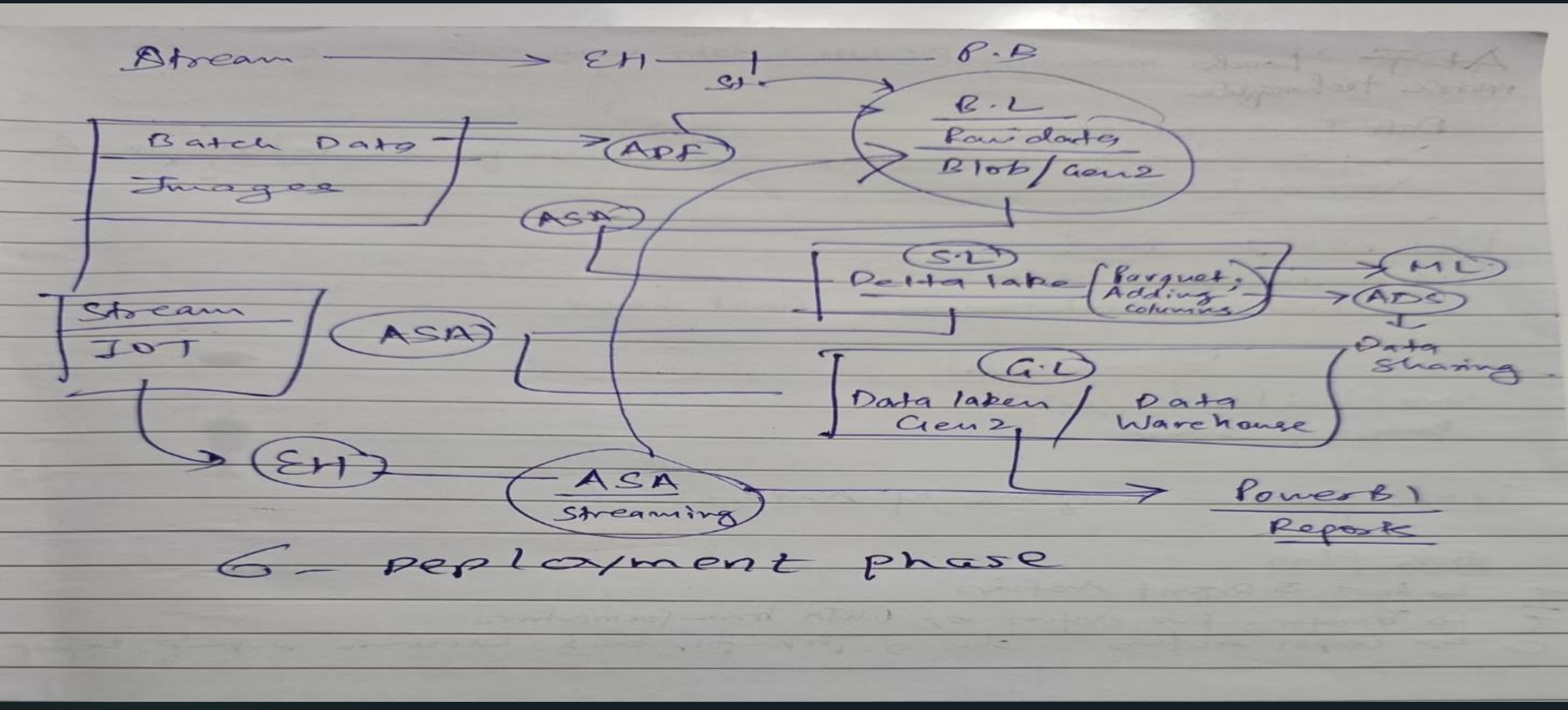
- **Medicine & Land Research:** Image-based insights.

  Delivery: Datasets via cloud storage.

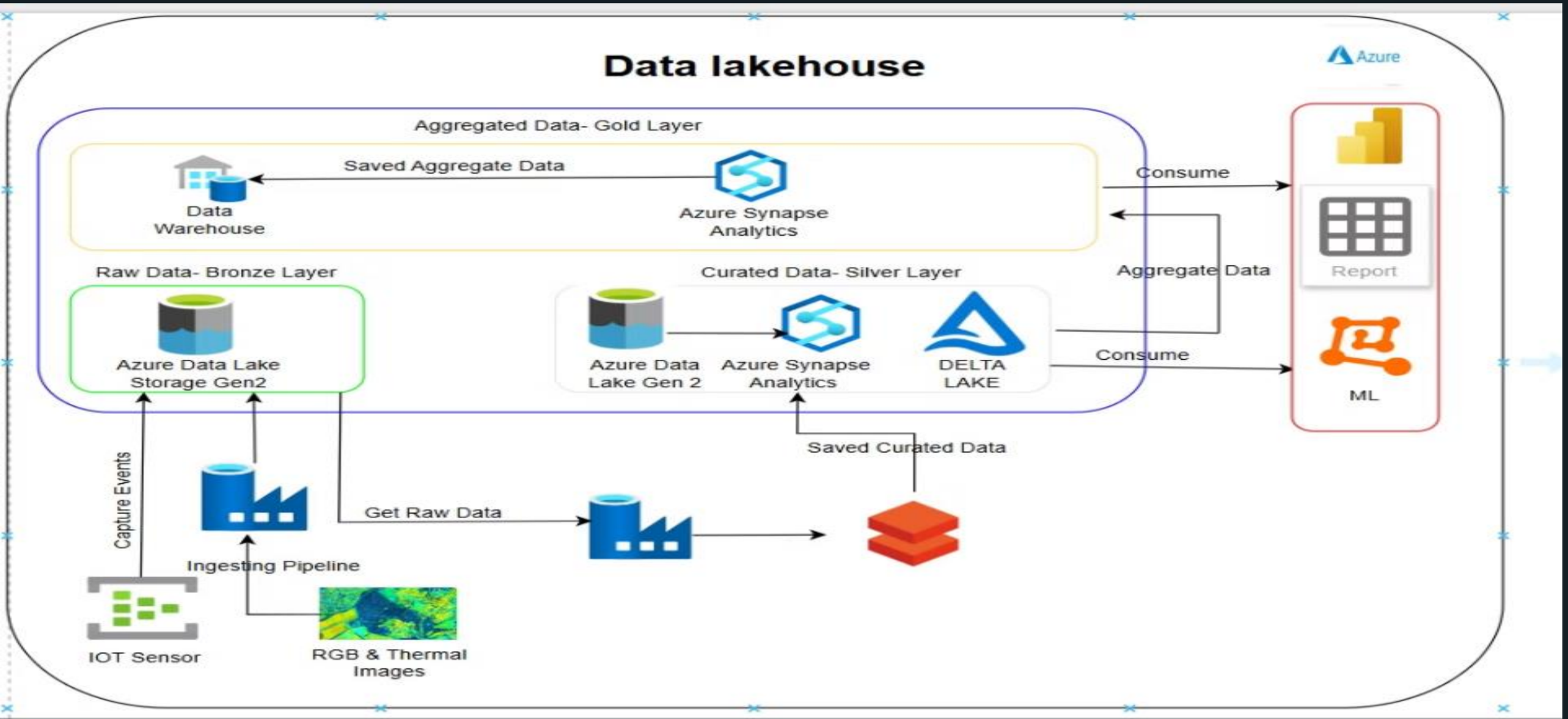
Cloud Architecture: Phase 1



Cloud Architecture: Phase 2



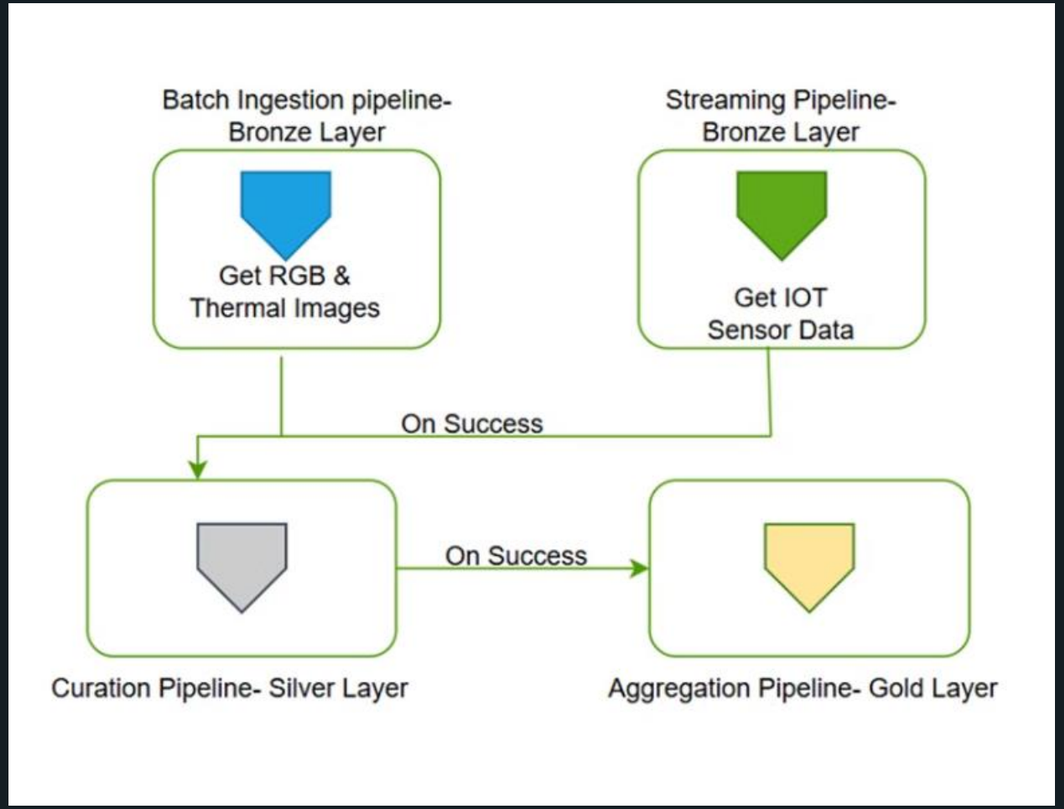
Final Lakehouse Architecture



Bronze Layer (Ingest Data)

Two data pipelines were created:

- Azure Data Factory handles batch ingestion for large datasets and reports via scheduled processing.
- Azure IoT Hub manages streaming ingestion of real-time sensor data, providing instant updates. These pipelines efficiently manage real-time and historical data.



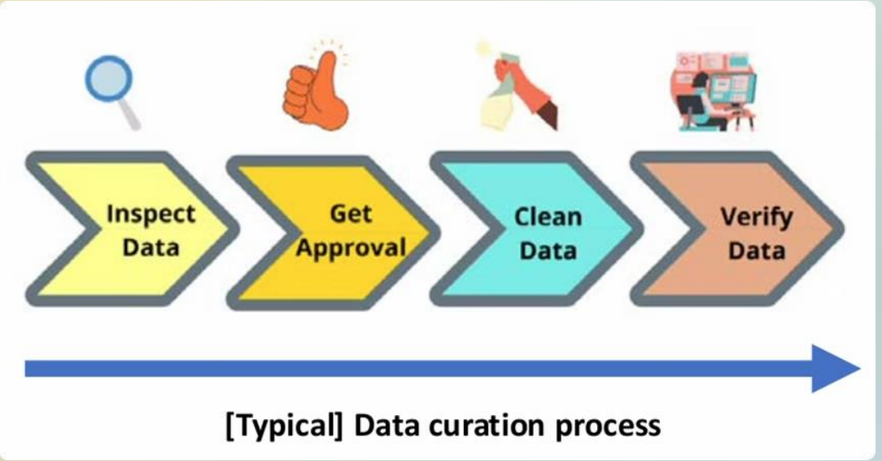
Silver Layer (Curate Data)

Data Curation Process The process starts by looking at sample data to check its quality.

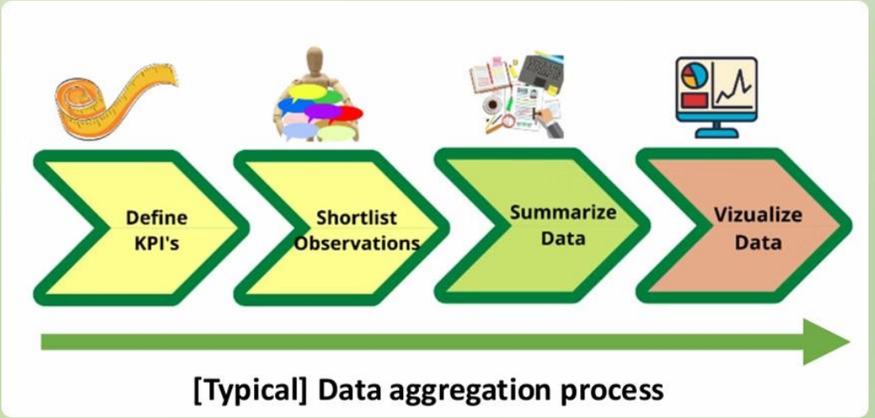
First, they visually check the data from different sources.

Sometimes, they need to use simple programs to find and fix problems like:

- Data that doesn’t follow a standard format.
- Incorrect or repeated information.
- Data that’s not secure or consistent.



[Typical] Data curation process



Gold Layer (Aggregate Data)

The gold layer combines and summarizes data to make it easier to understand.

It helps find patterns by looking at a group of data with certain details.

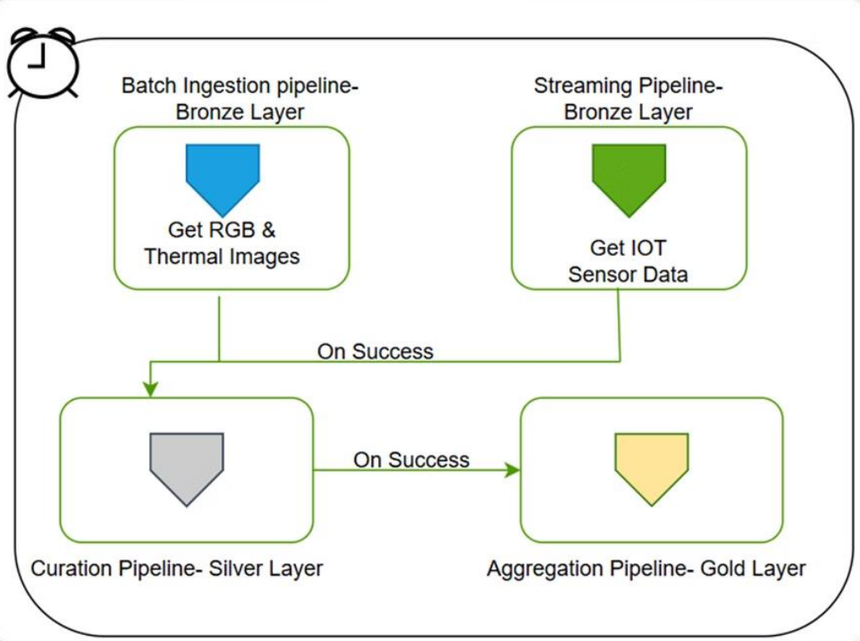
Crop Health Index: Identify early signs of stress or disease.

Soil Moisture Deviation: Detect under-irrigated or over-irrigated areas.

Pipeline Approach

We use an event-based approach for efficient data processing. A master pipeline oversees and triggers other pipelines based on event success or failure.

The master pipeline runs every 24 hours, starting at 12:05 AM, automating data processes, reducing manual effort, and minimizing delays.



Pipeline Failure

A pipeline failure means data processing is interrupted due to network issues, data errors, or system malfunctions.

Retry Attempts: The system automatically retries the pipeline up to 3 times after a failure.

Retry Interval: Each retry occurs after a 1-hour interval, allowing the system to recover from temporary issues. This minimizes downtime and prevents minor problems from halting the pipeline.

Conclusion

▪This report outlines a robust data-driven approach to agricultural consultancy using drones and AI. By centralizing multiple data sources, our platform enhances productivity, optimizes resources, and enables informed decision-making for a sustainable agricultural future.

Thank You