Integrated Smart Water-Focused Irrigation System using IoT and AI/ML

IT4010 – Progress Presentation 2 (PP2)

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HESARA P.K.A.N.
IT22561398

DILRUKSHA A.G.C.D.
IT22561770

TRISHNI W.R.M.
IT22076366

ABISHEK S.
IT22186942

Agenda

- PROBLEM & MOTIVATION
- PROPOSED SOLUTION OVERVIEW
- SYSTEM ARCHITECTURE & INTEGRATION
- COMMERCIALIZATION / IMPACT
- 1 MINUTE SOLUTION VIDEO
- DEMO PLAN

(FOLLOWED BY A 30-MINUTE LIVE SYSTEM DEMONSTRATION)

Problem & Motivation

Context, Key Problems, Stakeholders, and Impact

- CONTEXT

  Large irrigation schemes rely on manual scheduling and traditional farming decisions.

- KEY PROBLEMS

  • Irrigation schedules ignore real-time soil and weather conditions

  • Farmers lack reliable information about which crops to grow

  • Water shortages and floods are handled reactively rather than predictively

  • Field-level data is not connected with irrigation scheme management

- STAKEHOLDERS

  Primary Users: Farmers

  Secondary Users: Irrigation Scheme Managers , Agricultural Officers

  Decision Makers: Ministry of Agriculture , Irrigation Department

INEFFICIENT IRRIGATION RESULTS IN WATER WASTE, LOWER CROP YIELDS, AND ECONOMIC LOSSES FOR FARMERS.

Research Gap & Objectives

Existing irrigation systems:

- RELY HEAVILY ON MANUAL DECISION MAKING
- LACK PREDICTIVE ANALYTICS FOR WATER MANAGEMENT
- DO NOT INTEGRATE IOT SENSORS, MACHINE LEARNING, AND CROP OPTIMIZATION

There is currently no unified system that provides both predictive irrigation scheduling and crop recommendations.

MAIN OBJECTIVE

Develop an integrated IoT and machine learning platform that optimizes irrigation scheduling and crop planning using real-time sensor data and predictive analytics.

Solution Overview

A smart agriculture platform that integrates IoT sensors, machine learning, and predictive analytics to improve irrigation management and crop decision-making.

CORE FUNCTIONAL MODULES

F1 – IRRIGATION SERVICE

Real-time irrigation scheduling using sensor data.

F2 – CROP HEALTH SERVICE

CNN-based crop disease detection using images.

F3 – FORECASTING SERVICE

Machine learning predictions for rainfall and water availability.

F4 – OPTIMIZATION SERVICE

AI-based crop and land allocation recommendations.

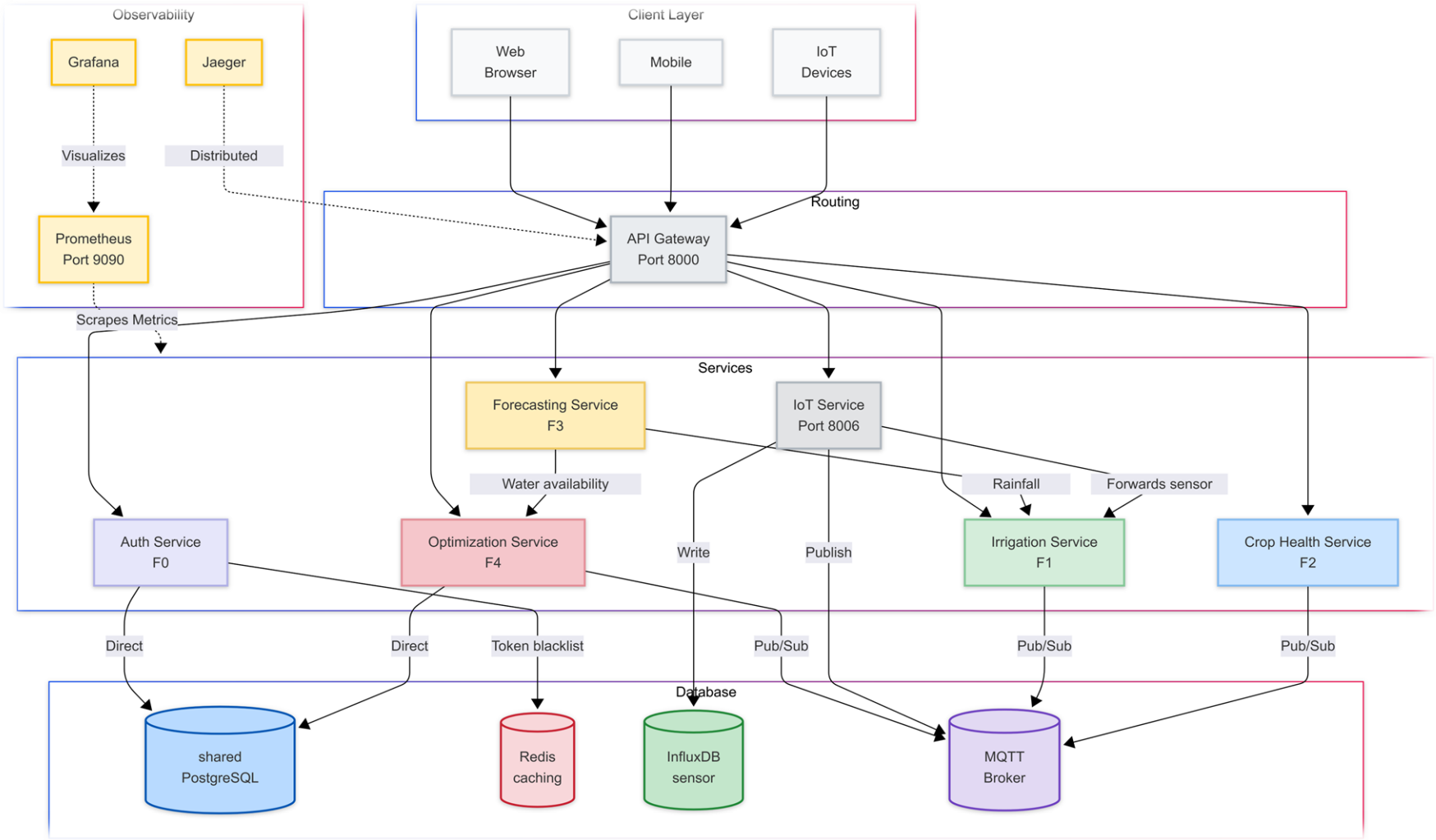
NON-FUNCTIONAL FOCUS

- SCALABILITY THROUGH MICROSERVICES ARCHITECTURE
- RELIABLE SENSOR DATA PROCESSING
- REAL-TIME MONITORING AND DECISION SUPPORT

CURRENT COMPLETION: SYSTEM IMPLEMENTATION ~90% COMPLETED

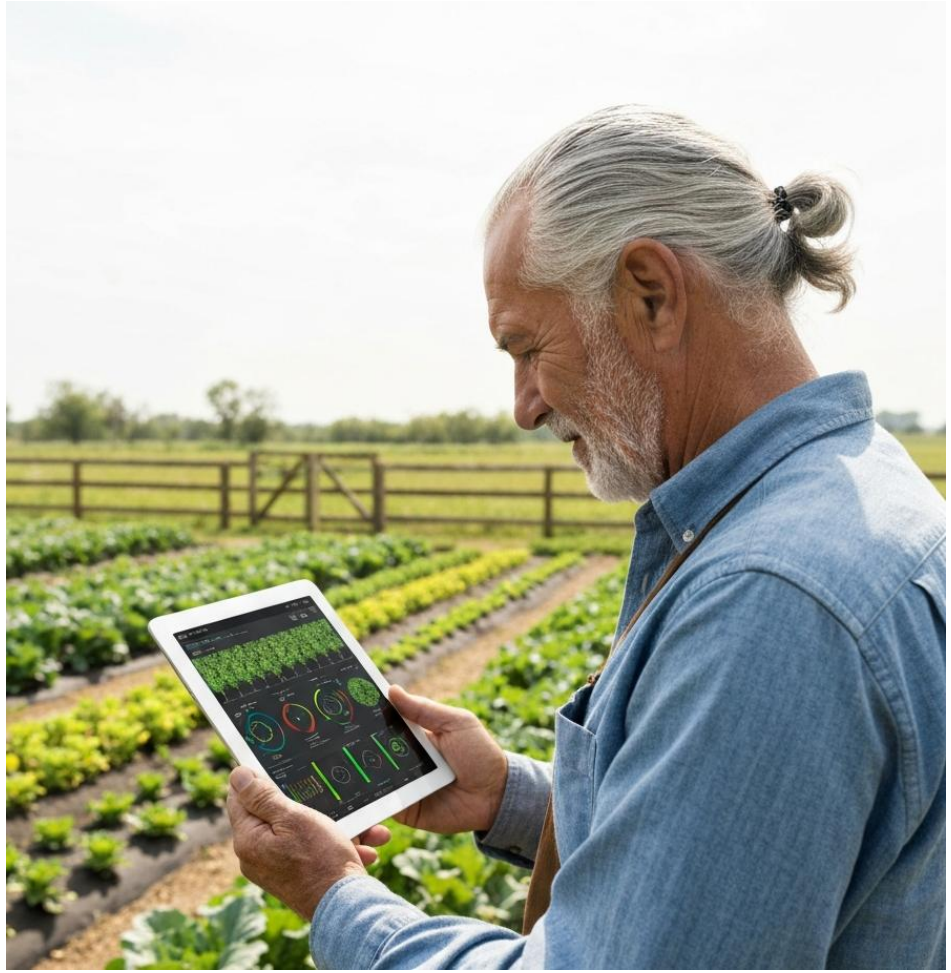
System Architecture & Integration

Microservices architecture connected through an API Gateway



THE SYSTEM FOLLOWS A MICROSERVICES ARCHITECTURE CONNECTED THROUGH AN API GATEWAY.

Commercialization / Impact



- TARGET USERS

  • Farmers • Irrigation Scheme Managers • Government agricultural agencies

- VALUE PROPOSITION

  Our platform enables: • data-driven irrigation decisions • optimized water resource usage • improved crop productivity Compared with traditional methods, the system supports predictive farm management instead of reactive decision-making.

- COST AND FEASIBILITY

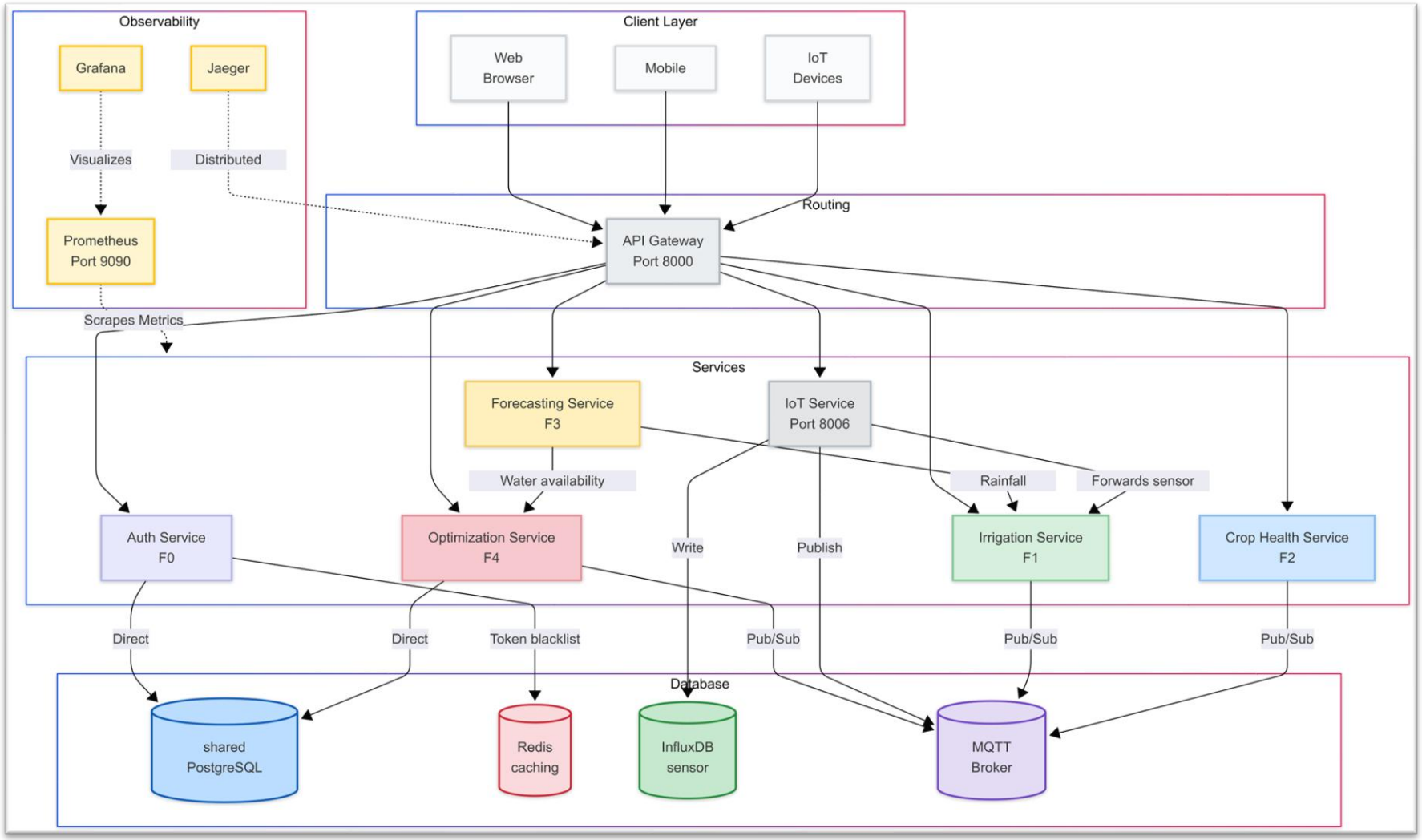
  IoT Sensor Node ≈ Rs. 8,500 per unit Cloud Infrastructure ≈ Rs. 15,000 per month

- REVENUE MODEL

  Freemium Model Farmers • Free: basic irrigation alerts • Premium: Rs. 500 per season Government / Organizations • Subscription-based analytics platform

Target Users, Value Proposition, Revenue Model

Integrated Architecture Diagram



1 Minute Solution Video

Demo Plan (30 min)

1. DEMO FLOW

   Step 1 – User login and dashboard overview

   Step 2 – IoT sensor data ingestion and visualization

   Step 3 – Irrigation prediction using real-time data

   Step 4 – Forecasting module showing rainfall predictions

   Step 5 – Crop health detection using image analysis

   Step 6 – Crop optimization recommendations

2. TEAM ROLES

   Member 1 → Authentication & dashboard

   Member 2 → IoT irrigation module

   Member 3 → Forecasting module

   Member 4 → Crop health & optimization module

3. BACKUP PLAN

   Recorded demo video available Preloaded sensor datasets ready

KEY FEATURES TO OBSERVE

Real-time sensor ingestion ML-based irrigation prediction Crop health detection Optimization recommendations

Q&A

Thank You!