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AI for Bharat Hackathon

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Team Name : Assemblers

Team Leader Name : Sandeep Udeg

Problem Statement : **[Professional Track] AI for Rural Innovation & Sustainable Systems**

Project Title: Gram-Setu (Unified Rural Engine)

Vision

Gram-Setu is a **Unified Rural Ecosystem (URE)** platform designed to bridge the digital divide for India's heartland. Instead of isolated tools, we provide a **Multi-Agent "Operating System"** that manages the three most critical pillars of rural life: **Agricultural Health, Government Welfare Access, & Sustainable Resource Management**.

Core Solution

Our solution employs a **Supervisor-Worker Architecture** to act as a proactive digital companion for rural citizens:

- **Orchestrator:** A central "Supervisor" agent that manages intent and conversation state, ensuring that data flows seamlessly between domains.
- **Agri-Expert :** Provides instant crop disease diagnosis using multimodal vision grounded in the Plant Village dataset and connects users to real-time Mandi prices.
- **Policy-Navigator :** Simplifies complex government schemes (like PM-Kisan and PKVY) using RAG (Retrieval-Augmented Generation) to provide eligibility hallucination-free advice.
- **Eco-Resource :** Processes soil and weather data to provide precise irrigation and energy schedules, significantly reducing resource waste.

Technical Architecture

- **Intelligence:** Powered by **Claude 3.5 Sonnet** via Amazon Bedrock for high-fidelity reasoning.
- **Orchestration:** Built using the **Strands Agents SDK** for modular, agentic workflows.
- **Data Strategy:** Uses **Amazon S3** for image and sensor log storage, with **Bedrock Knowledge Bases** for grounding policy advice in verified datasets.
- **Responsible AI:** Integrated with **Bedrock Guardrails** to ensure all advice is safe, culturally sensitive, and **privacy-compliant.**
- **MCP:** It allows orchestrator to securely connect to external data source and act as a standardized **plug and play** interface between Agent and data

Impact & Scalability

Gram-Setu is built to be voice-first and multilingual, making it accessible to users regardless of their literacy level. By optimizing resource use and providing direct market/subsidy linkages, the platform aims to increase net farmer income by **18–22%** while reducing water consumption by up to **45%.**

Your solution should be able to explain the following

How different is it from any of the other existing ideas?

Unlike existing siloed agri-tech solutions, our platform unifies multiple rural services into a single AI-driven ecosystem that delivers integrated, actionable decisions

- Potential for AI-driven unified decision support not just for specific tasks but for overarching strategy
- Holistic integration of data across advisory, environmental, market, and operational layers
- A shift from standalone tools or service networks to intelligent ecosystem insights

How will it be able to solve the problem?

By integrating fragmented rural data and applying AI-driven decision intelligence, the platform transforms complex agricultural challenges into clear solutions.

- Data Integration from Multiple Sources
- AI-Driven Analysis & Intelligence
- Actionable Recommendations
- Actionable Recommendations
- Trade-off Based Decision Making
- Continuous Learning & Improvement

USP of the proposed solution

A unified AI decision ecosystem that transforms fragmented rural data into actionable, intelligent decisions

- One Platform, One AI Brain
- Trade-Off Aware Decision Intelligence
- Ecosystem-Scale Impact

Core Differentiator

Competitive Positioning: Unified Rural Ecoystem (URE)

Gram-Setu URE

Targeting 150 Million Smallholder Farmers in India

Target Customer Segments

- Smallholder Farmers (1.08 hectates avg,)
- Low-Literacy Users (Voice-First)
- 12+ Indian Regional Languages
- Service-Integrators

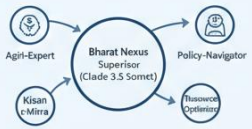
Market Category

- AI-Powered Agri-Advisory
- Multi-Agent Converstion AI
- Rural Digital Ecoystems

Competitor Type Landsape	Competitive Landsape	URE's Advantage
Direct (Agri-Te-Tech)	E-commerce & siloted AI advisory	Agentic Orchsteration: Specialized, collaborative agents
Direct (Dawemt (Data-as-Service)	E-commerce & siloed AI advisory	Proactive Intelligence: IOT triggers & reatme alerts
Indrect (Govt. e-Mitra)	Satellite imagry & NDVI analysis	Contextual Cross-talk: Links as diagnosis to subsidies

Core Differentators

1. **Supervisor-Worker Agent Orchestation**



Modular, scalable architecture

1.

2. **Contextual Synthesis (Cross-Talk)**

3. **Grounted** Event-Driven

1 Auto-links insights (e.ge, Pest → Subsdy)

3. IOT triggers alerts BEFORE crop stress

4. Amazined RAG & Safety Guardrails Bedhock: Factual Accuracy & Privacy

Unique Value Proposition (UVP)

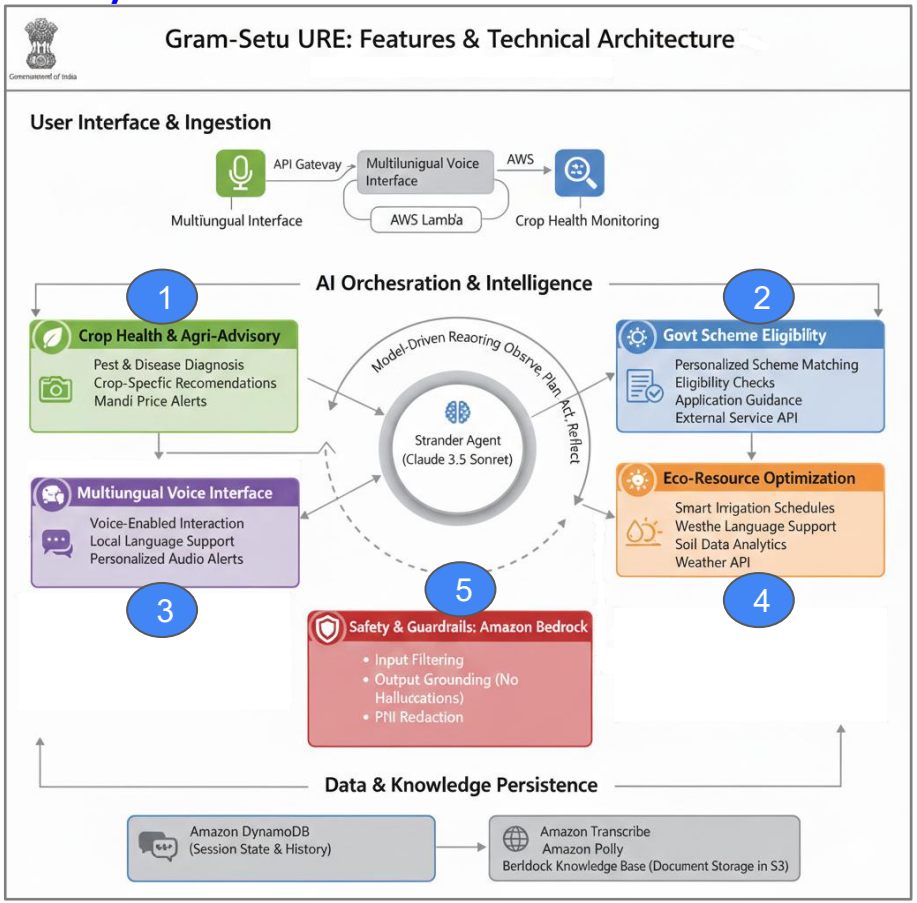
URE: A proactive, synthsizez "Digital Village Companion" that anticipates needs and and coordinates expert solutions.

Strategic Moats

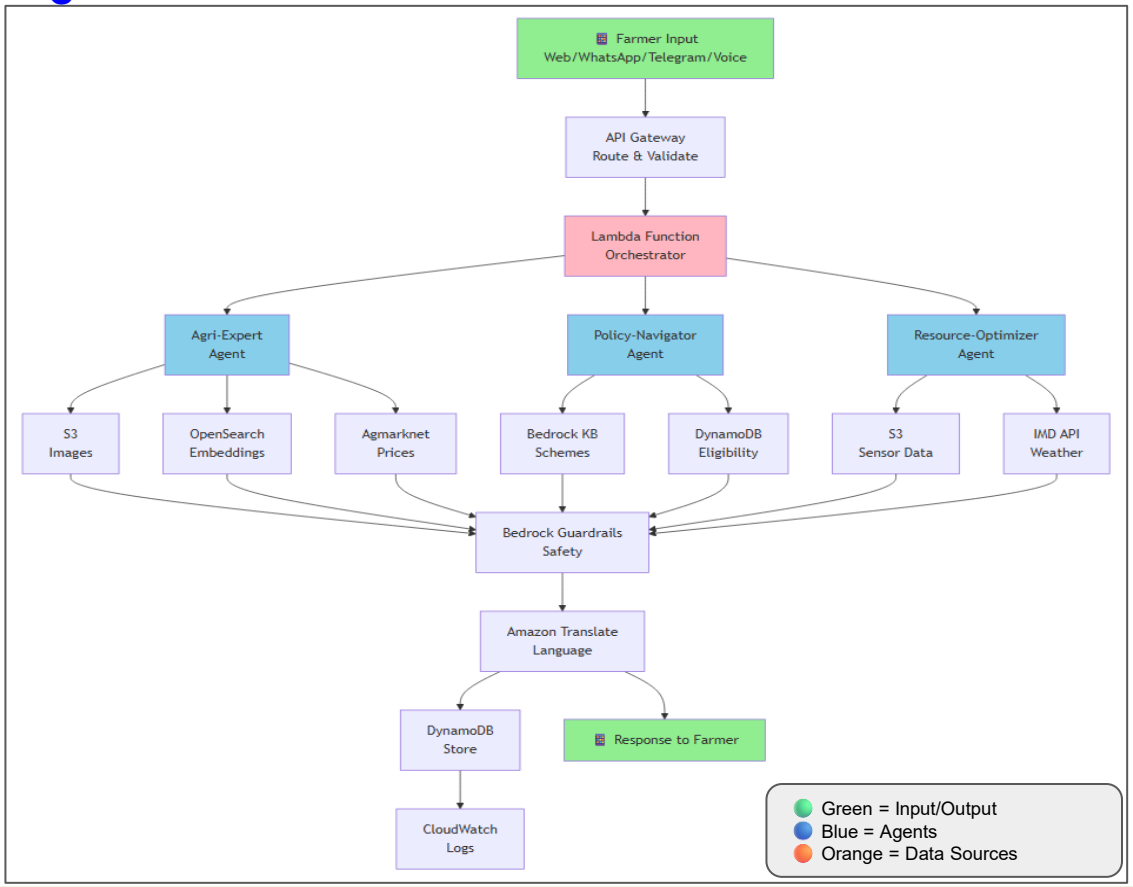
- Architectural Complexity
- Servles-First Trust

Voice-First Trust

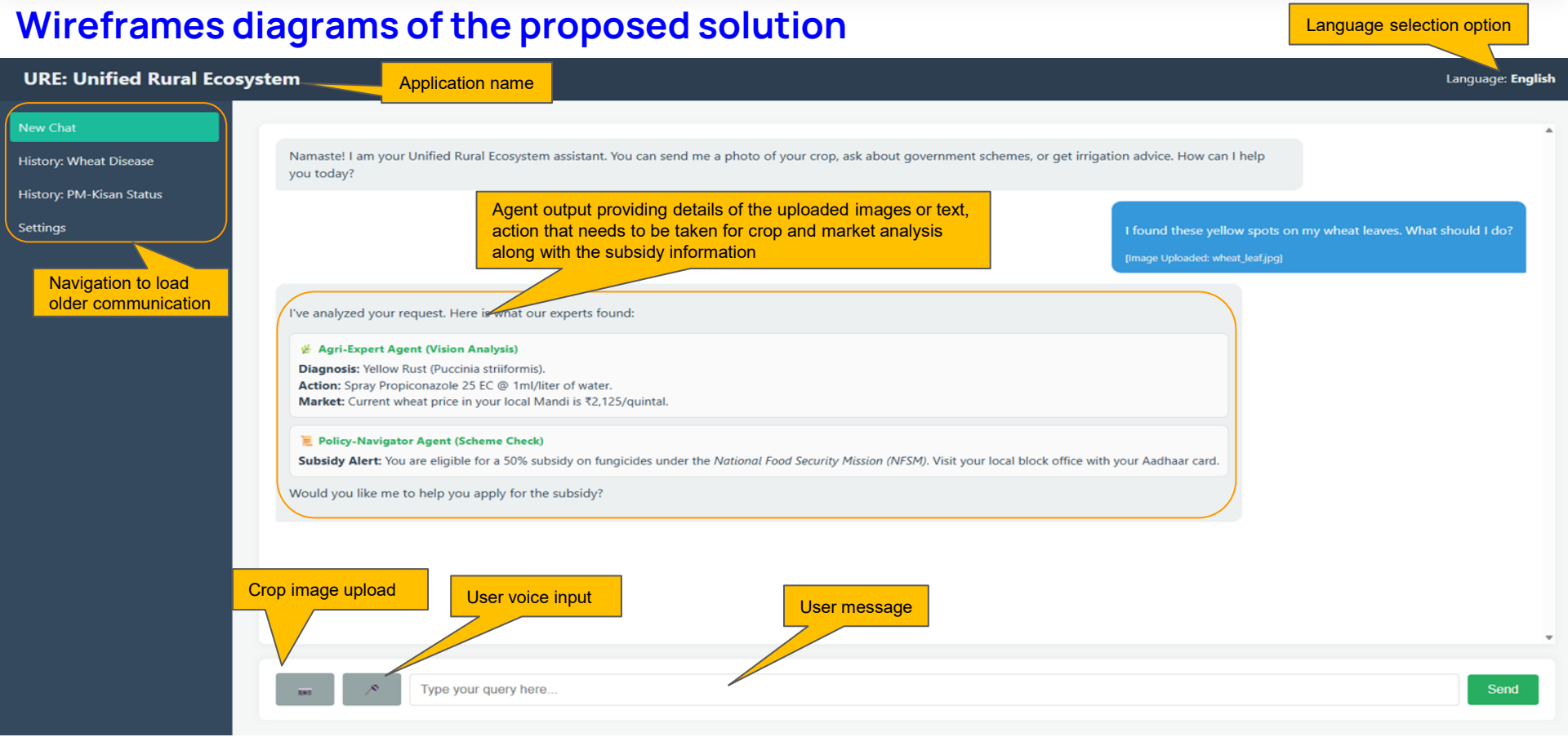
List of features offered by the solution



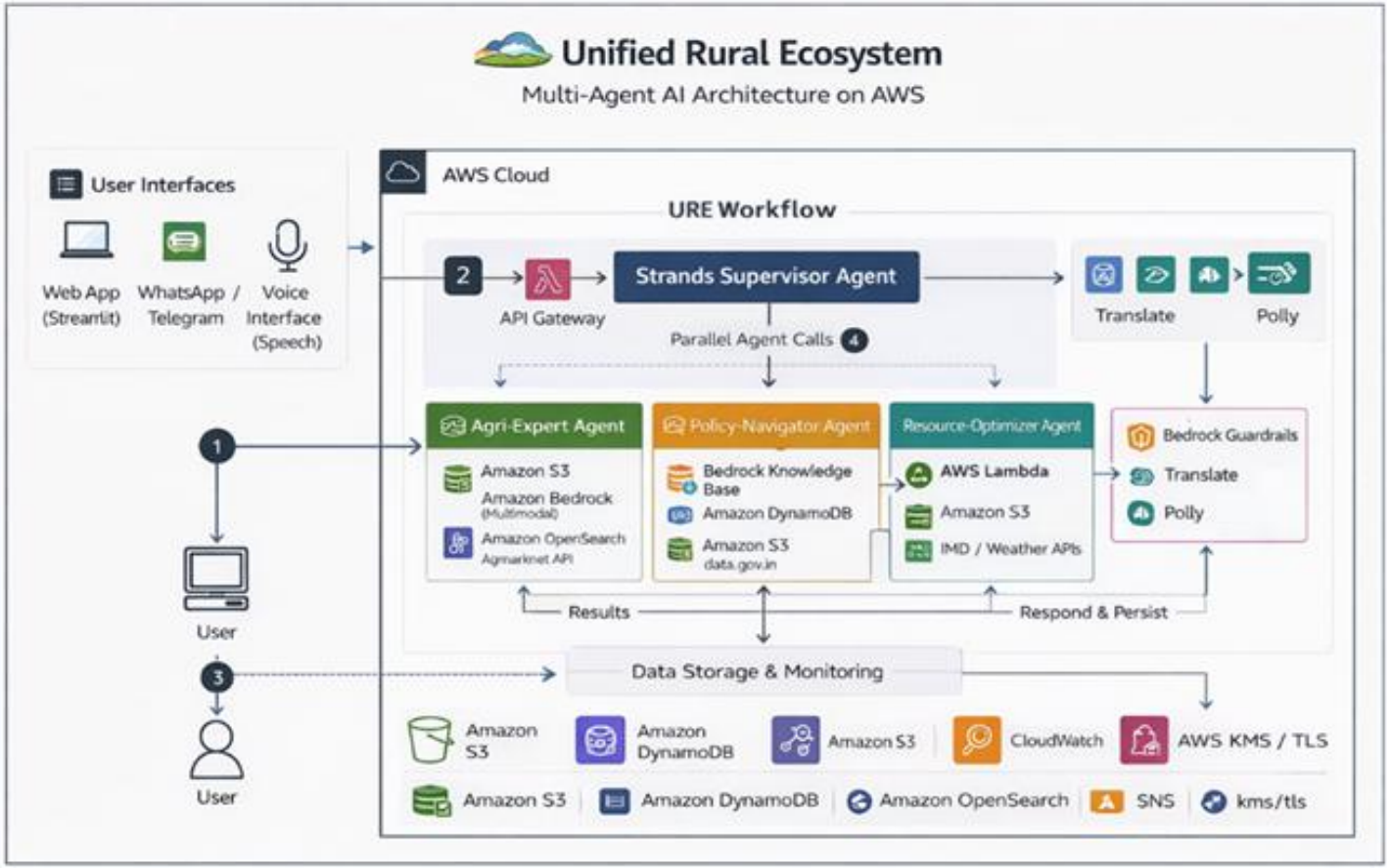
Process flow diagram



Wireframes diagrams of the proposed solution



Architecture diagram of the proposed solution



Technologies to be used in the solution

1. Core Intelligence Layer

- **Amazon Bedrock:** Hosts and manages foundation models securely at scale
- **Anthropic Claude 3.5 Sonnet:** Handles advanced reasoning and decision-making
- **Amazon Titan Embeddings:** Generates vector embeddings for semantic search

2. Orchestration & Agents Layer

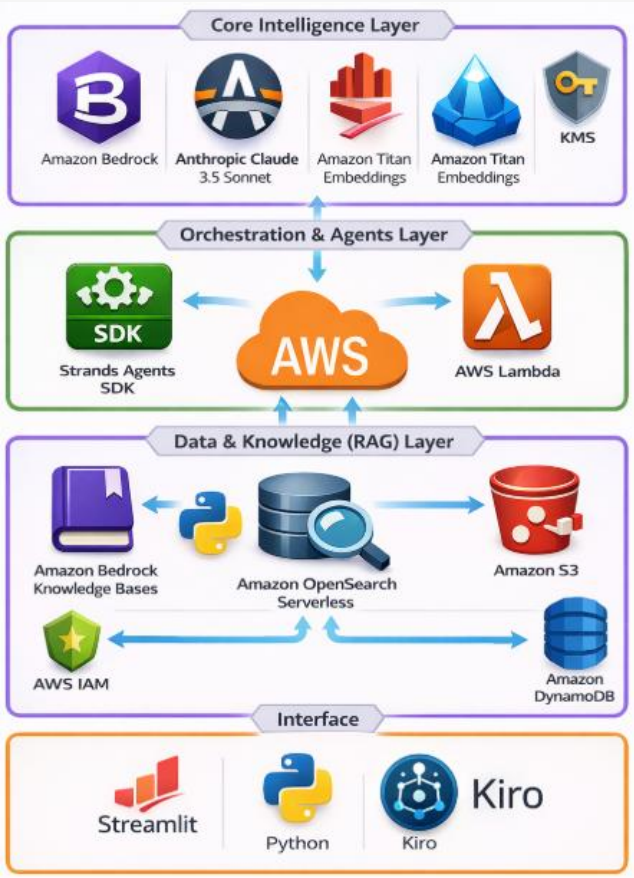
- **Strands Agents SDK:** An open-source framework used to build the Supervisor-Worker agentic architecture
- **AWS Lambda:** Provides serverless compute to execute logic and connect agents to external APIs

3. Data & Knowledge (RAG) Layer

- **Amazon Bedrock Knowledge Bases:** Manages the RAG pipeline to link agents to private data source
- **Amazon OpenSearch Serverless:** The vector database for low-latency retrieval of government schemes
- **Amazon S3:** Scalable object storage for the Plant Village dataset and user-uploaded images
- **Amazon DynamoDB:** Maintains session state and metadata.

4. Connectivity & Interface

- **Streamlit:** User-facing application interface
- **Python Runtime:** Core execution environment for agent workflows
- **Kiro Tool:** Supports agent monitoring and debugging



Estimated implementation cost (1/2)

Layer	Service	Cost Model	Estimated Cost
Core Intelligence	Amazon Bedrock (Claude 3.5 Sonnet)	Pay-per-inference (tokens)	Moderate - High
Core Intelligence	Amazon Titan Embeddings	Pay-per-embedding	Low
Orchestration & Agents	Strands Agents SDK	Open-source	Free
Orchestration & Agents	AWS Lambda	Pay-per-invocation	Very Low
Data & Knowledge (RAG)	Bedrock Knowledge Bases	Usage-based	Low
Data & Knowledge (RAG)	Amazon Open Search Serverless	Storage + query-based	Moderate
Data & Knowledge (RAG)	Amazon S3	Pay-per-storage	Very Low
Data & Knowledge (RAG)	Amazon DynamoDB	On-demand reads/writes	Low
Interface	Streamlit	Open-source	Free
Interface	Python Runtime	Open-source	Free
Interface	Kiro Tool	Tooling / Dev support	Minimal
Model Context Protocol	MCP	Open-source	Free

Notes :

1. Total cost is directly proportional to the number of users. 2. Depending on LLM selected cost can be further optimized

Estimated implementation cost (2/2)

Cost Analysis & Optimization

Live financial simulator for the Gram-Setu Multi-Agent Ecosystem (Hackathon Preview)

Scale (Active Users) 600

OPTIMIZATION STRATEGY

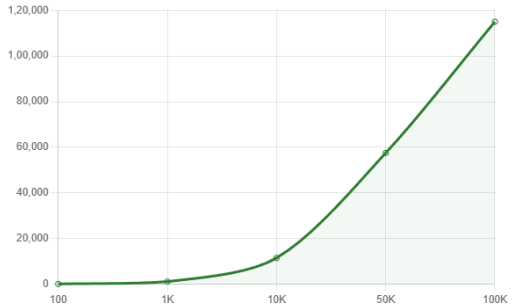
- **Prompt Caching** ☐ Up to 90% discount on repeated context—critical for conversation history.
- **Batch Mode** ☐ 50% discount for non-real-time tasks (e.g., daily report generation).
- **Model Tiering** ☐ Use Claude 3.5 Haiku for simpler queries, reserving Sonnet for complex tasks.
- **Routing Layer** ☐ Pre-classify queries to bypass Supervisor for FAQ-style questions, reducing agentic overhead.

STRATEGY IMPACT ANALYSIS

- **Efficiency Gain:** 0.0%
- **Opex Avoidance:** $0/mo
- **Scale Readiness:** Growth Phase

EST. MONTHLY OPEX **$690**

UNIT COST / USER **$1.15**



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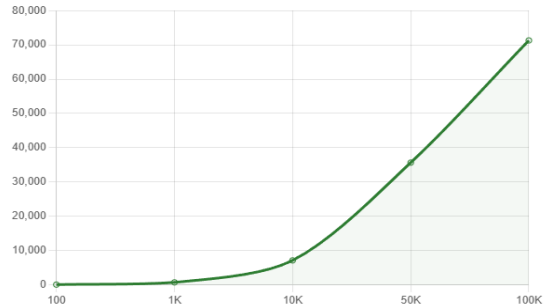
STRATEGY IMPACT ANALYSIS

- **Efficiency Gain:** 38.0%
- **Opex Avoidance:** $262.2/mo
- **Scale Readiness:** Growth Phase

EST. MONTHLY OPEX **$427.8**

UNIT COST / USER **$0.71**



Monthly Cost Projections (ap-south-1)

Assumptions:
- 90 interactions/user/month (60% text, 20% image, 20% RAG)
- supervisor + specialist = 2 Bedrock calls minimum
- 1024 MB Lambda, 3s duration; HTTP API Gateway
- DynamoDB on-demand for user context persistence

Strategy Definitions

- **Prompt Caching:** Reuses cached token IDs to bypass compute.
- **Batch Mode:** Leverages asynchronous processing for 50% API cost reduction.
- **Model Tiering:** Cost-optimal routing between Claude model variants.
- **Routing Layer:** Heuristic-based shortcutting to minimize LLM inference.

Please click here to view the Cost Analysis

**it's only for simulation purposes actual cost may differ on case to case basis

Scan QR Code to view on Mobile

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Thank You