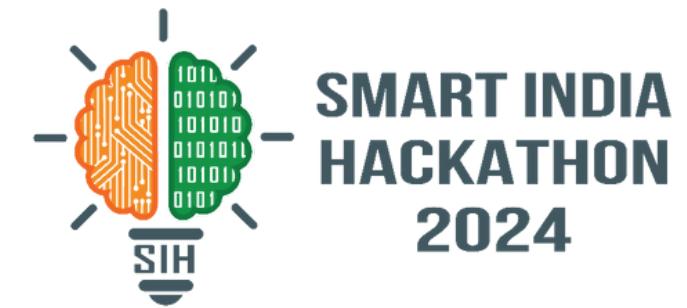


SMART INDIA HACKATHON 2024



Problem Statement ID – SIH1645

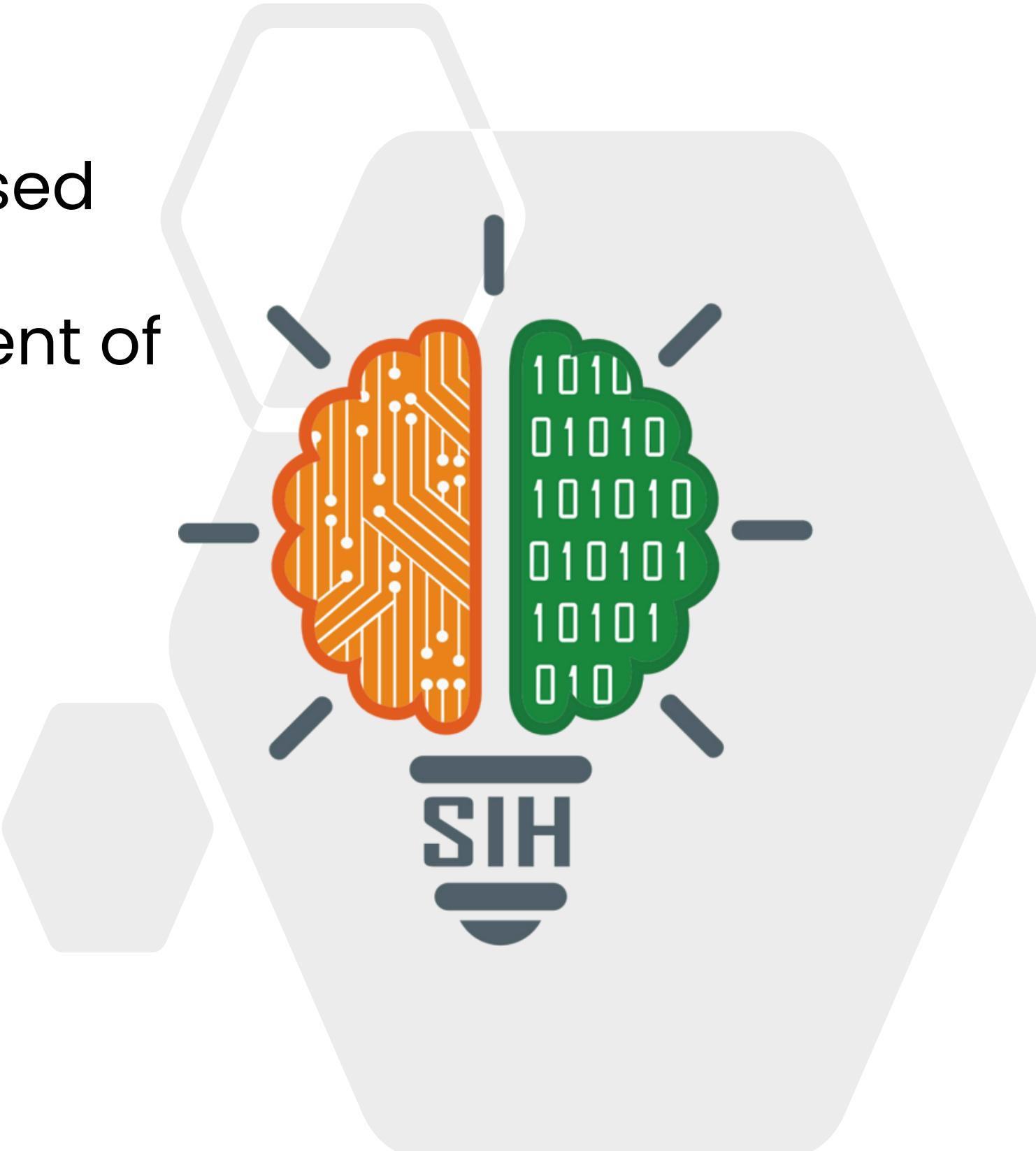
Problem Statement Title - An app and web based software for Productivity and safety management of coal mines.

Theme – Smart Automation

PS Category- Software

Team ID- 289

Team Name(Registered on Portal) - Arize



SOLUTION

CoalWorks is a mining operations software that combines App, Web, and IoT for a smoother, safer, and more efficient mining process.

- **Web dashboard for supervisors** to monitor activities, plan rounds, track tasks, and handover shifts
- AI-powered assistant suggests round planning and assigns the right personnel to handle issues
- OCR is used to scan and convert paper logbooks into easy template based digital forms
- Mobile app for workers to view shift details and log events like issues, alerts, injuries, etc.
- Admin Dashboard for easy integration with existing DGMS-compliant SMPs and logbooks
- Easy data migration from existing ERP systems using data mapping and APIs

We solve the problem with complete mining software tailored for India, offering digital logging, safety management, and AI/IoT for efficiency.

CoalWorks is **50% completed**; testing and validation are ongoing.

WHY WE STAND OUT ?


 Predictive Simulation and Analysis AI Engine

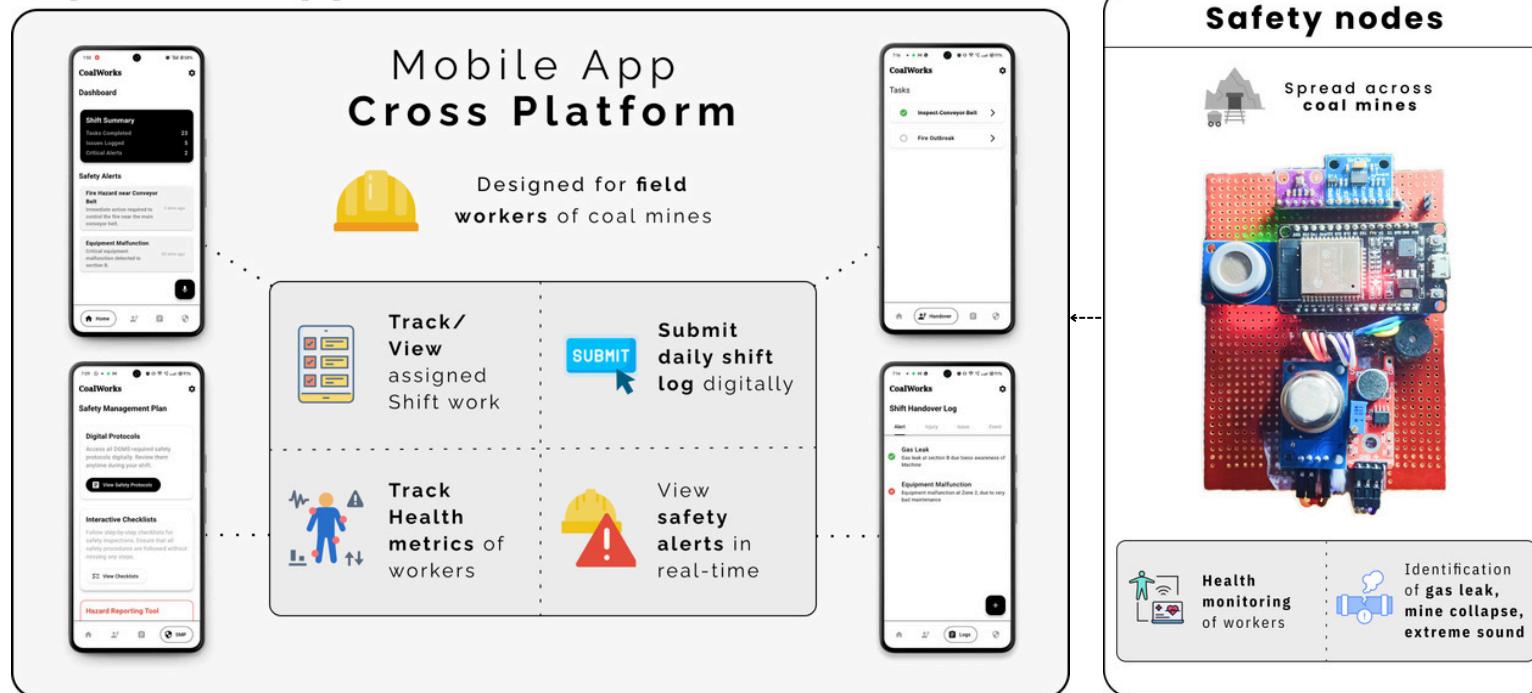
Supervisors can simulate mine operations, estimate needs for better decisions.


 Optimizing Workflows and Resources

Our AI predicts hazards, plans shifts, assigns tasks, optimizes resources and safety.

PROTOTYPE

Operator App

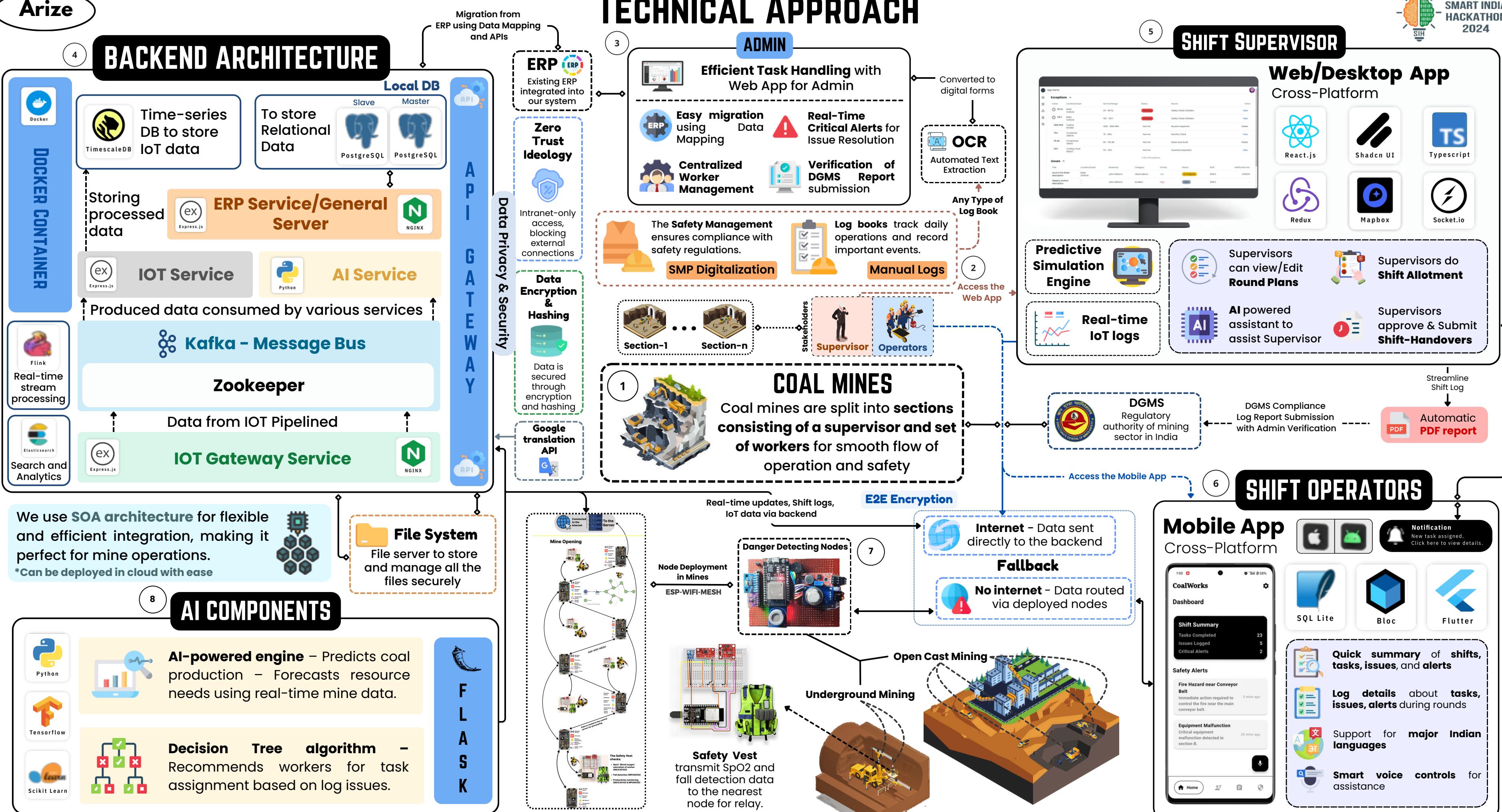


Supervisor App



We support **10+ languages** with an easy **UI/UX**, hassle free logging of tasks using **smart voice controls**

TECHNICAL APPROACH



FEASIBILITY



Technical Feasibility

India's coal industry is expected to **grow by 7.57%** (2024-2029), and our AI/IoT software **improves productivity and safety** in mining.



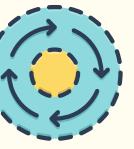
Operational Feasibility

India's IT spending is at **\$2.48 billion** this year, and our system **digitizes logs and safety**, reducing errors and **increasing efficiency**.



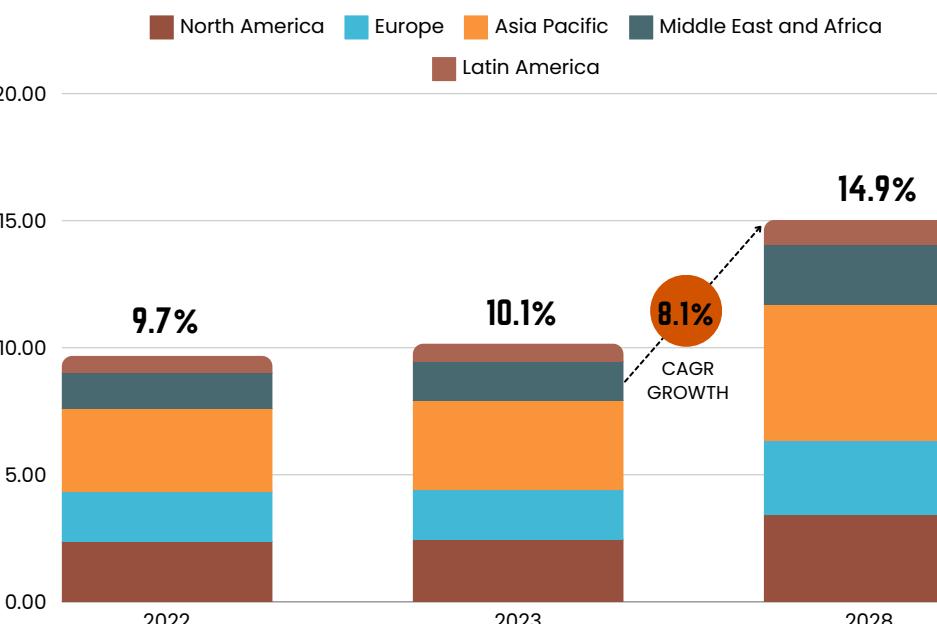
Economic Feasibility

Our software can be developed in India for **35–50% less** than in the West, making it both **practical and affordable** for the market.



Regulatory Feasibility

Software **automates DGMS compliance checks**, enhancing safety and easing audits in mining.



Market Viability

The Digital India initiative is driving tech adoption, creating a favorable environment for our software.

Sustainable Viability

The global mining software market is growing at an **8.1% CAGR**, ensuring sustained demand for our product.

CHALLENGES

Integrating into existing coal mine operations in India and ensuring smooth user adoption



Language barriers

- Indian Regional languages Support



Integration with ERP

- ERP migration via mapping and APIs



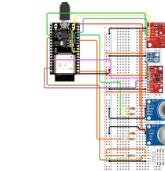
System compatibility

- Docker guarantees system consistency.

Hands-on training

- 2-week training with hands-on practice

Ensuring actual safety in mines and accurately cross validating workers' productivity



Scalable nodes

- Real-time scalable worker safety nodes



Vital Sensors

- Sensor vests monitor workers' vital signs

AI Analysis

AI engine uses sensor data to track calories burned, distance, and activity metrics

Managing data communication and ensuring safety and privacy in no-internet zones?



Mesh Network

- IoT mesh network for network routing



Local DB

- Local databases avoid data loss during outages.

Zero Trust Policy

- Access limited to only Verified users



E2EE

- End-to-end encryption protects all data

IMPACTS AND BENEFITS

Economic Benefits

Though there's an upfront cost, the system pays off by cutting down on downtime and preventing accidents, leading to substantial long-term savings and increased productivity.



Social Benefits

CoalWorks enhances worker safety and well-being while promoting sustainability through efficient resource management, contributing to safer operations and reduced environmental impact.

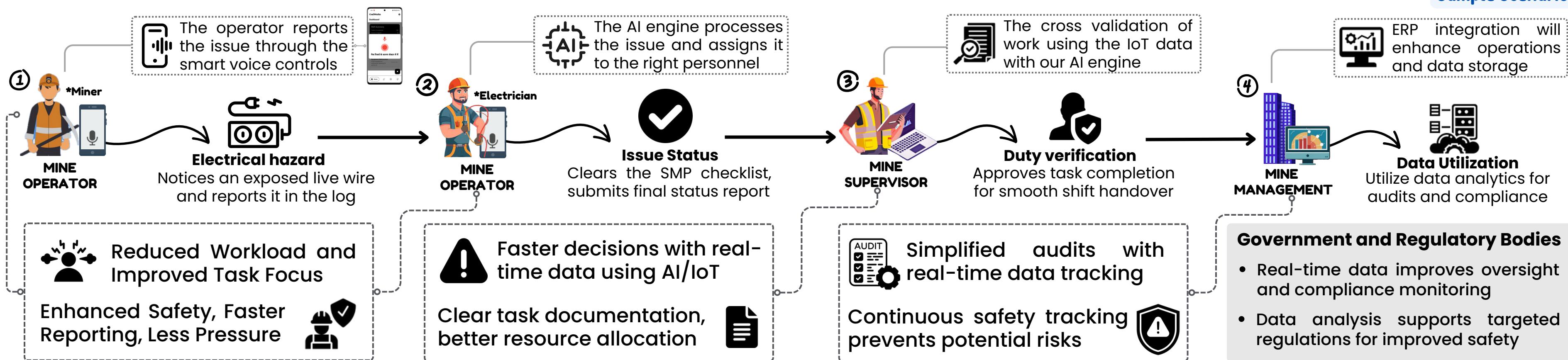


Environmental Benefits

Improved efficiency and reduced downtime can lead to more effective use of machinery, potentially lowering emissions and reducing the carbon footprint of mining operations.

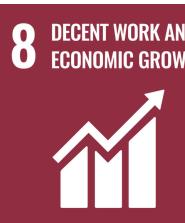


STAKEHOLDERS & IMPACTS



OUR PROMISE

Our solution perfectly aligns with the UN Sustainable Development Goals.

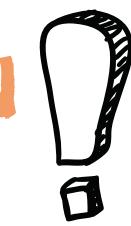


India's Goal:

Reach 1.5 B Ton by 2030 [Fy April 2030-March 2031]
On 2023 India Produced 997.83 M Tons, so the CAGR is 6.7%
 $CAGR = (1.504)^{\frac{1}{1}} - 1 \approx 0.067 \text{ or } 6.7\%$

*Consolidated Proof documents of all research is provided in slide 6

CoalWorks is projected to improve efficiency by 7.69%, validated against existing solutions.



7.69% increase adds 385.275 million tons, cutting the government's target by 22.67% for 2030.

COAL MINES IN INDIA - RESEARCH



India's commercial coal mining began in 1774, expanding with steam locomotives in 1853.



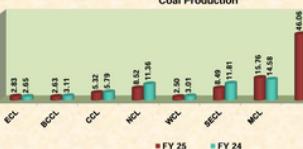
Coal is a **vital energy source** in India, fueled by steel industry needs and rising energy demands.



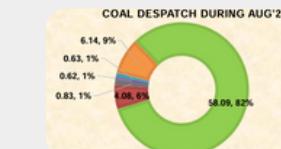
Mining in India
India, second-largest coal producer, 2022

[Click here](#)


Production Stats
India's position in global coal production

[Click here](#)


India's coal production dropped **7.51%** to 62.67 MT in Aug'24 from 67.76 MT in Aug'23.



Power utilities despatch rose **2.92%** to 58.09 MT in Aug'24 from 56.44 MT in Aug'23.

Coal Mines Regulation and Working

DGMS regulates **coal mine safety** in India, enforcing standards under the Mines Act to protect workers and machinery. It also **conducts inspections, accident investigations, and safety audits** to ensure compliance.

They **publishes reports and case studies**, which are valuable references for researchers **analyzing mine safety trends, accidents, and technological advancements**.

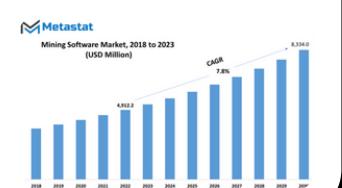
[Click here](#)

MARKET - RESEARCH

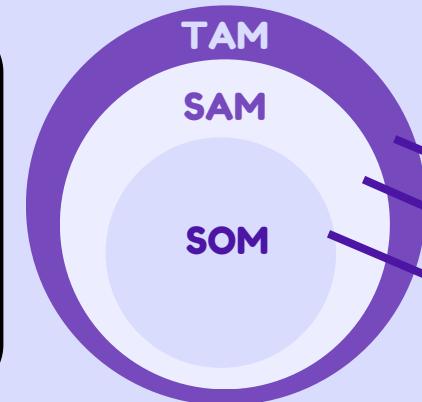


Mining Software Market

Analysis of global mining software trends



As of 2023, the global mining software market is projected to reach \$8,334 million by 2030.



TAM - Total Addressable Market
SAM - Service Available Market
SOM - Service Obtainable Market

₹ 77,190 crore
₹ 23,157 crore
₹ 1,158 crore

Mid-Sized Mine Revenue Breakdown

Number of Workers: 500

Safety Vests: 100 units

Mine Danger Detection Nodes: 100 units

Safety Vests

Units: 100

Price per Unit: ₹728

Total: ₹72,800

Service and audits

Monthly Cost: ₹5,000

Software Sales: Profit margins on software (85%) due to low development cost.

Hardware Sales: Profit margins on hardware (30%) due to material cost.

Safety Nodes

Units: 100

Price per Unit: ₹720

Total: ₹77,800

Installation Fees

Units: 200

Price per Unit: ₹980

Total: ₹196,000

Total Revenue

Year-1: ₹846,600

[Click here](#)

CLICK ON THE IMAGES TO VISIT LINKS



GitHub

You can see the Project files of CoalWorks here

[Click here](#)

Our Works



Proof Documents

Consolidated proof documents of all the work

[Click here](#)

IoT - REFERENCES



ESP MESH

ESP32: Versatile Wi-Fi and Bluetooth IoT chip

[Click here](#)


Wifi in coal mines

Wi-Fi enhances safety monitoring in coal mines

[Click here](#)

AI/ML - REFERENCES



Intelligent scheduling

Efficiently assigns shifts based on availability

[Click here](#)


Hazard prediction

Anticipating hazards for preparedness.

[Click here](#)

BACK END



Kafka

[Click here](#)

Kafka's superior scalability sets it apart from other messaging systems



Apache Flink

[Click here](#)

Flink is a scalable, real-time, distributed stream processing engine

MINE OPERATIONS SOFTWARE - REFERENCES



Minemax

Tools for optimizing mine planning and scheduling

[Click here](#)

Minemax provides software solutions for mine planning and scheduling, helping mining companies optimize operations and manage costs efficiently.



Innovapptive

Software for Operations, Plant Maintenance, and Warehousing

[Click here](#)

This advanced software is designed to optimize resource allocation and enhance operational efficiency for companies in various sectors.