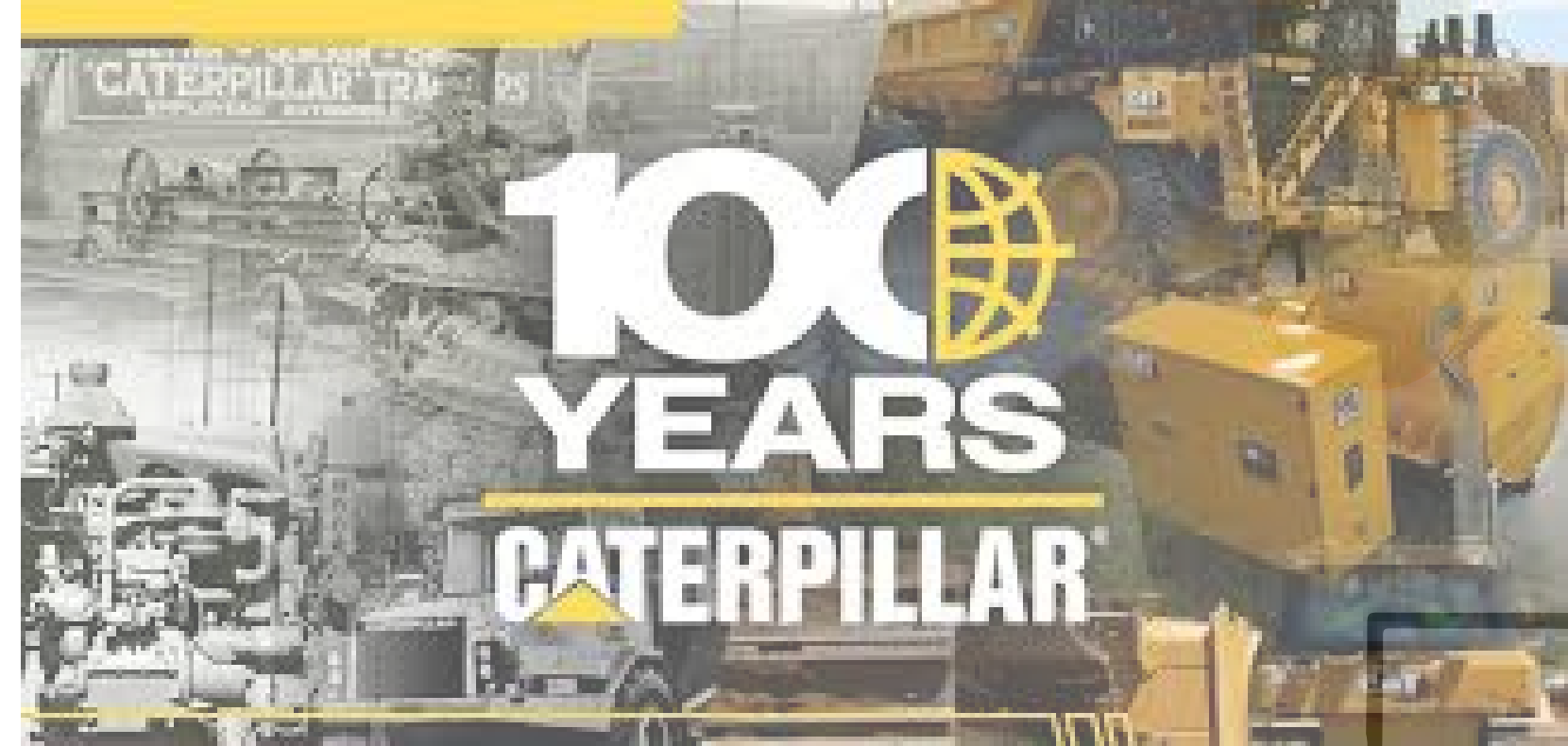




SMART DIGITAL OPERATORS

By TrialBla@zers4

INTRODUCTION



- Heavy equipment operators face safety risks and performance challenges in mining & construction.
- Smart Digital Operators assist them through real-time monitoring and task guidance.
- This solution integrates machine data, safety alerts, and productivity tools on a web-based platform.

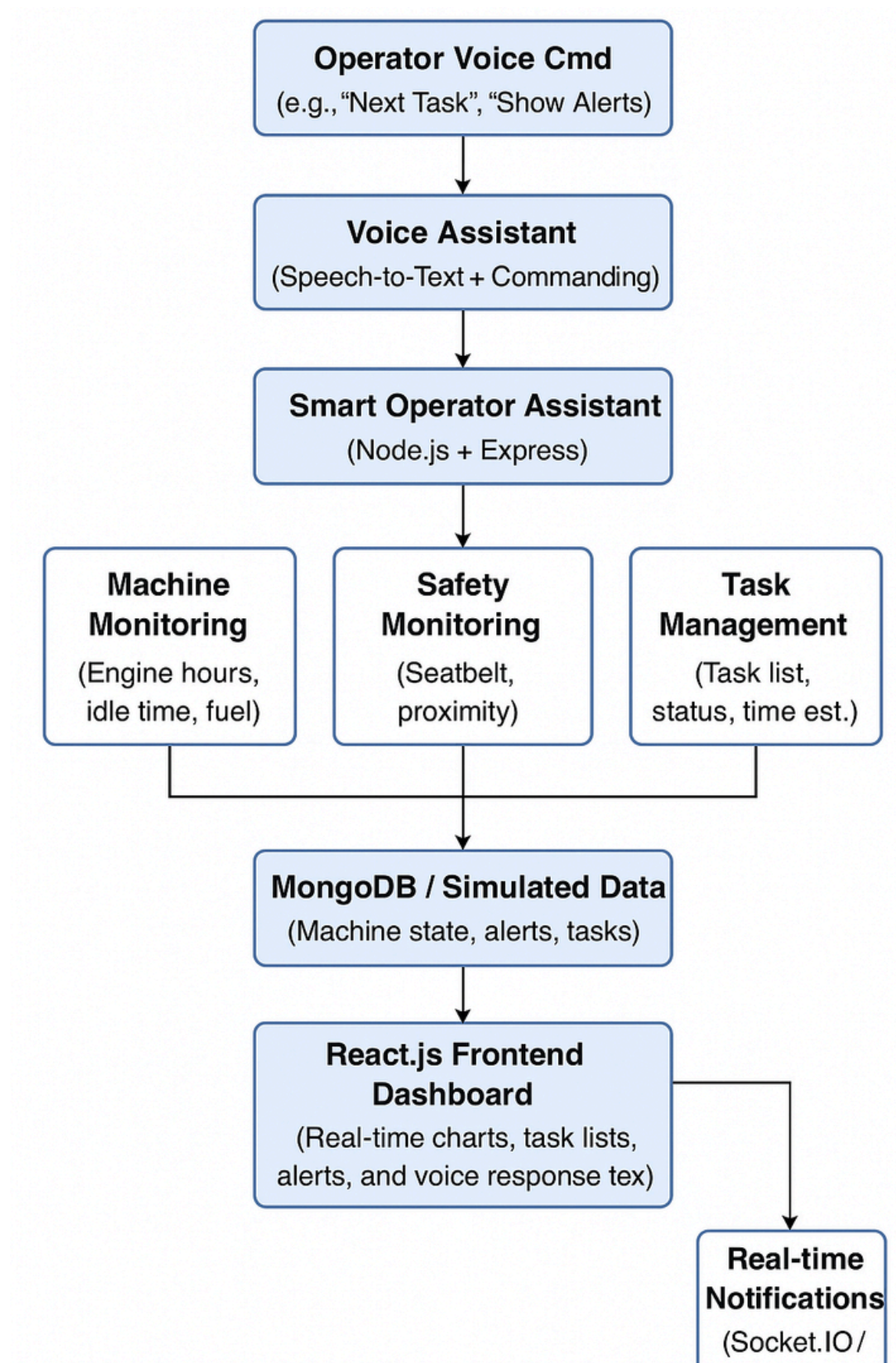
OBJECTIVES

- ✓ Improve operator safety compliance
- ✓ Simplify daily machine operation workflows
- ✓ Predict task completion times for better planning
- ✓ Monitor and analyze machine behavior in real-time

FEATURES

- Machine Behavior Monitoring (Engine hours, idle time, fuel usage)
- Safety Alerts (Seatbelt status, hazard proximity detection)
- Daily Task Dashboard (Shift goals & checklists)
- Task Time Estimation (Basic predictive logic)
- Training Hub (Operator learning modules)

WORKFLOW



PROPOSED SOLUTION

- Task Assignment & Monitoring:
 - Admin can assign tasks to operators with detailed instructions and safety guidelines.
- Operator Dashboard:
 - Operators can view scheduled tasks, mark progress, and stay updated in real time.
- Interactive E-Learning Module:
 - Operators can watch training videos, ask questions, and receive contextual answers.
- Context-Aware Q&A using LLM:
 - Video are converted to intelligent responses.
- Proximity Hazard Detection:
 - GPS-based telematics system is used to detect nearby hazards; distances are calculated using Haversine distance for Accuracy at Construction Scale and safety alerts.

SAFETY AND ALERTS

- Alerts for seatbelt violations and unsafe proximity
- Warnings for excessive idle time
- Encourages completion of shift tasks efficiently

Operations Dashboard

Monitor real-time operations and performance metrics



Active Operators

12 +2



Active Machines

8 -1



Tasks Completed

24 +8



Hours Worked

96 +12

Active Tasks

Excavate Foundation Site A

John Smith • CAT 336F

Progress

75%

Clear Debris from Road

Sarah Johnson • CAT D6T

Progress

45%

Grade Construction Zone

Mike Davis • CAT 140M3

Progress

90%

Machine Status

CAT 336F Excavator

Operator: John Smith

Active

Fuel: 85%

CAT D6T Bulldozer

Operator: Sarah Johnson

Active

Fuel: 62%

CAT 140M3 Grader

Operator: Mike Davis

Active

Fuel: 78%

CAT 725C Truck

Operator: -

Maintenance

Fuel: 45%

BENEFITS

- Enhances operator safety with real-time alerts for seatbelt status and proximity hazards.
- Improves machine productivity by minimizing idle time and optimizing load cycles.
- Provides operators with clear daily task lists and progress tracking.
- Enables hands-free operation using a voice assistant for safer and faster interactions.
- Promotes operator learning and upskilling via integrated training modules.

FUTURE SCOPE

- Integration with real Caterpillar Product Link™ and MineStar™ sensors
- AI-powered task time prediction and fatigue detection
- Environmental hazard alerts (weather, dust)
- Voice-based operator assistance & mobile app support

CONCLUSION

Smart digital operator system creates a safer and more efficient work environment. The prototype, built using modern web technologies, shows the potential for further development with real sensor integration, AI-based analysis, and predictive maintenance. This project lays a strong foundation for smarter, more connected mining operations, promoting digital transformation in heavy industries.



THANK YOU