



CloudXStack

DESIGNED FOR SCALE · BUILT FOR TRUST



TECHNOLOGY · ENGINEERING · PLATFORM DEVELOPMENT

Maritime Voyage Simulation Platform

Transforming maritime logistics through predictive intelligence.

The Challenge

A leading Indian steel conglomerate faced critical bottlenecks in iron ore transportation through a complex river-sea route with strict operational constraints.

Route Complexity

356 NM river section plus 400 NM sea section with distinct navigation rules and restrictions.

Time Constraints

Night navigation bans and tide waiting requirements severely limit operational windows.

Capacity Limits

Critical river capacity restricts inner channel to maximum two vessels simultaneously.

The Solution

Maritime Voyage Simulation Platform transforms reactive tracking into proactive, predictive maritime voyage management through advanced simulation technology.

01 Real-Time Tracking

Live dashboard monitoring all active vessels with instant operational metrics.

02 Predictive Simulation

Discrete-time engine modeling entire voyage lifecycle in 15-minute intervals.

03 Scenario Testing

What-if analysis for risk assessment and contingency planning.

Platform Architecture

MODERN TECHNOLOGY STACK

- Frontend: React 19.1.1 with TypeScript and Tailwind CSS for responsive, intuitive interfaces
- Backend: Django 5.2.7 with REST Framework for robust business logic and secure API
- Data Science: Pandas, NumPy, and scikit-learn powering ML-driven predictions
- Database: PostgreSQL ensuring scalable, transactional data storage

Intelligent Decision Engine

Queue Optimization

Applies intelligent priority rules: FCFS, highest capacity first, or lowest capacity first to manage vessel queues.

Smart Cargo Selection

Automatically selects cargo types and discharge ports based on vessel preference and availability.

ML Integration

Predicts cargo capacity and event durations using historical data for accurate simulations.

Core Features

- 01

Live Active Vessels Dashboard
Real-time monitoring with live operational and financial metrics using the same logic as the simulation engine.
- 02

Discrete-Time Simulation
Models entire voyage lifecycle incorporating all real-world constraints including river capacity, night bans, and tide waiting.
- 03

Vessel State Machine
Tracks 12 distinct states from waiting at loading port to voyage completion for precise time-in-state analysis.
- 04

Scenario Testing
Test delay and breakdown scenarios with instant delta metrics against baseline for risk assessment.

Measurable Impact

40%

Reduced Idle Time
Significant decrease in non-productive vessel waiting time through bottleneck identification

35%

Increased Throughput
More consistent cargo flow ensuring reliable raw material supply to steel plants

25%

Lower Costs
Optimized logistics costs per metric tonne through efficient scheduling

30%

Better Utilization
Improved fleet performance with more completed voyages per vessel

The Transformation Journey

From manual chaos to automated excellence.

BEFORE

- Manual Excel planning — days to forecast capacity
- Unknown idle capacity — 30–50% underutilized ports
- No revenue forecasting — outcomes unknown until completion
- Opaque vessel performance — no visibility into efficiency
- Reactive handling — disruptions discovered during execution



AFTER

- Automated simulation — 30-day forecasts in 60 seconds
- Optimized utilization — system identifies gaps & schedules vessels
- Accurate projections — revenue, costs, profit margins predicted
- Clear KPIs — track voyages, cargo, utilization, idle time
- Proactive planning — restrictions factored into schedules upfront

Maritime Voyage Simulation Platform delivers unprecedented control and insight into complex maritime supply chains, unlocking efficiency gains and cost savings in bulk commodity logistics.



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Building Resilient Digital Ecosystems

Founded in 2025 and based in Thane, Maharashtra, CloudXStack is your trusted partner in digital transformation. We help organizations of all sizes design, build, secure, and scale modern digital solutions across cloud platforms.

With security, scalability, and performance at our core, we enable faster innovation, reduced operational risk, and tangible business outcomes. Together, we build resilient, intelligent, and future-ready digital ecosystems.

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