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Smart Port Transformation at the Port of Beira

Improving Terminal Operations Through Innovation and Technology Built in Mozambique

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A Port in Motion

- Thousands of containers and tonnes of cargo moved daily
- Operations powered by people, machines, and technology
- Two terminals: container and general cargo
- Dozens of equipment types and multiple systems involved
- Dynamic internal/external factors
- Continuous challenge to optimize operations efficiently

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Our Terminal Operating Systems

Navis N4 – Container Terminal (CT)

- Manages gate, yard, vessel, and truck operations
- Automates invoicing with N4 Billing module
- Vessel and yard planning via XPS
- Real-time updates with N4 Mobile
- Customer access through N4 CAP portal
- API integration with CDMS 2.0 and C-Gate
- Planned upgrade to version 4.0 in Q2 2026

CommTrac – General Cargo Terminal (GCT)

- Controls gate, rail, and vessel operations
- Real-time cargo inventory and truck movement
- Supports berth planning and load/discharge
- Comprehensive reporting tools
- Planned upgrade to CommTrac v4 in Q4 2025

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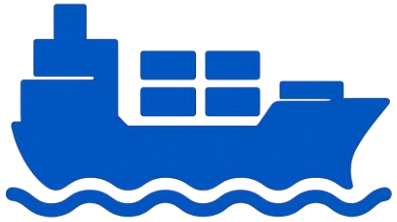
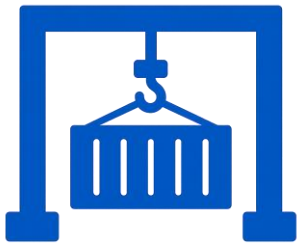
The Foundation



Ship Operations



Crane Operations

Yard Operations

Gate Operations

Rail Operations

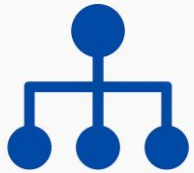
People

Devices

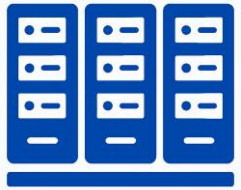
navis N4

CommTrac Powered by TBA

Terminal Operating Systems



Network



IT Infrastructure

Technology Challenges

Limitations of Existing Systems

- TOSs are robust but not all-in-one solutions
- Off-the-shelf platforms lack flexibility for Beira's complexity
- Limited visibility into equipment and human performance
- Difficulty in adapting standard tools to local needs

Our Approach

- Goal is to complement—not replace the TOSs
- Build smart, integrated apps to fill operational gaps
- Focus on enhancing visibility, traceability, and decision-making

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From Foundation to Integration

API Integrations Across Systems

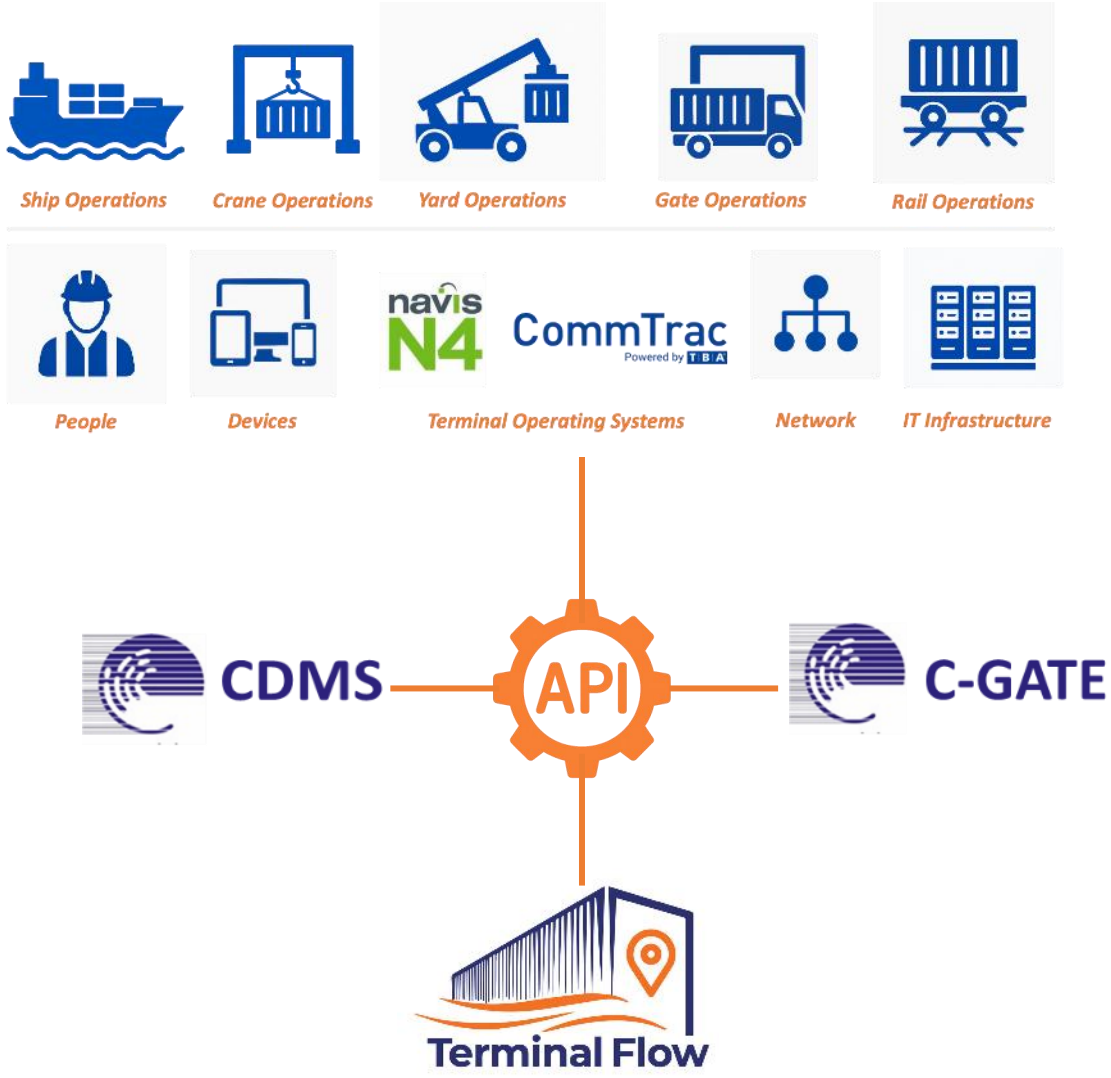
- Enable seamless data exchange with CDMS for customers and suppliers

C-Gate Optimization & Automation

- Streamline gate movements through AI, OCR, and LPR

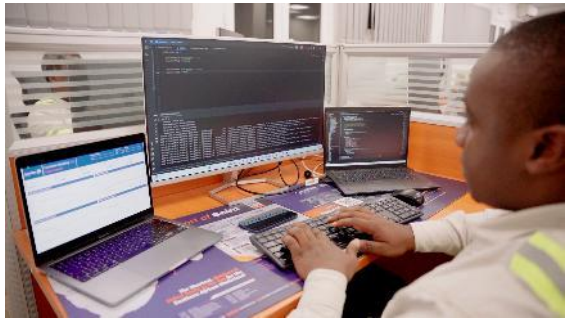
Terminal Flow Integration

- Centralize real-time data on equipment and cargo
- Boost operational visibility and decision-making
- Unlock advanced analytics, automation, and performance tracking



Internal Development Approach

- Developed in-house to respond quickly to terminal-specific needs
- Integrated with Navis N4 and CommTrac via APIs
- CodeLabs identifies and trains young developers through programming challenges
- Agile SCRUM ensures fast iterations; SSDLC guarantees secure development
- Prototyping and R&D drive validation of emerging technologies



From CDMS to C-Gate

Digitalizing Documentation and Gate Operations

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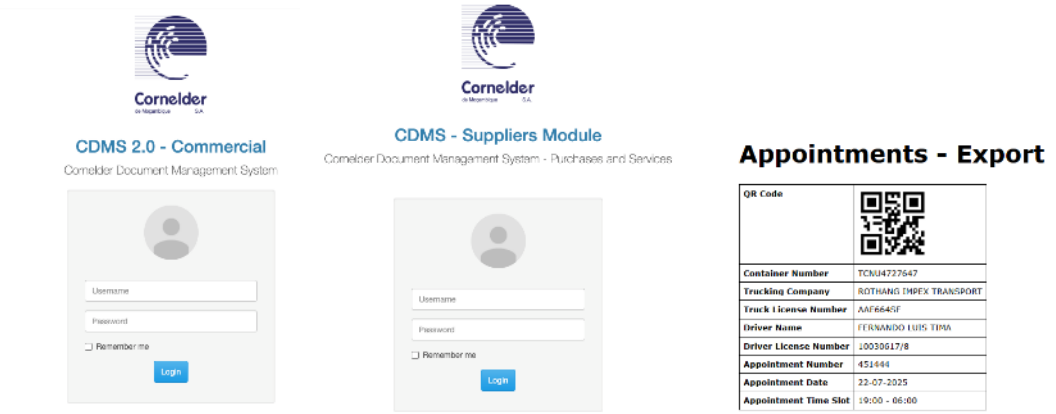
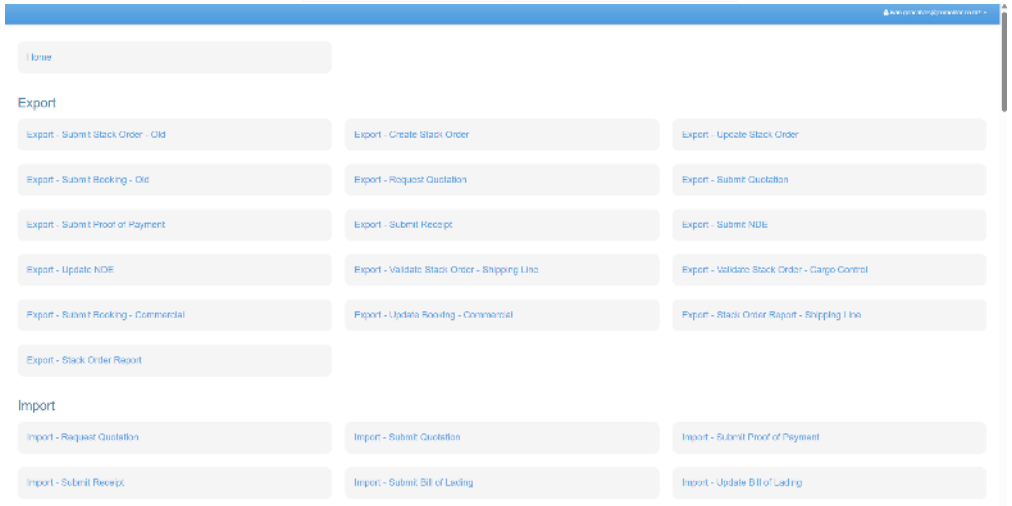
CDMS - Cornelder Document Management System

- Internally developed system launched in 2020, during the COVID-19 pandemic
- Manages appointments, service requests, invoices, and document flow
- Includes supplier portal for purchase orders, invoice submission, and payment tracking
- Latest version (CDMS 2.0) adds:
  - Truck Appointment module
  - Stack Order automation
  - Direct integration with Navis N4 for process validation
- Eliminated paper-based processes, improving efficiency, traceability, and client communication





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C-Gate – Cornelder Gate Application

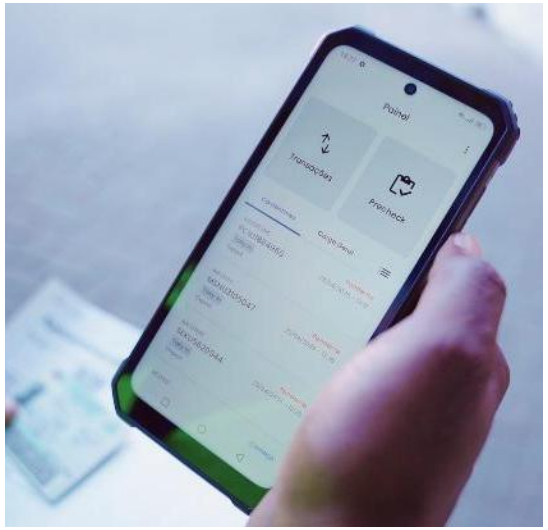
Internal system for digital gate control, replacing manual paper logs

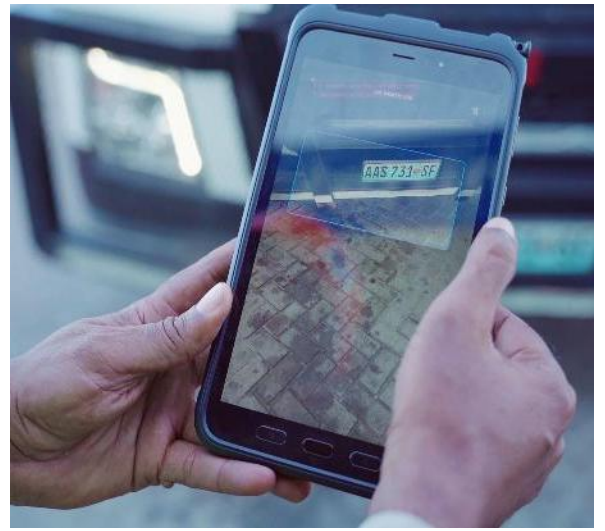
Launched in 2022 in CT, with expansion to GCT in 2024

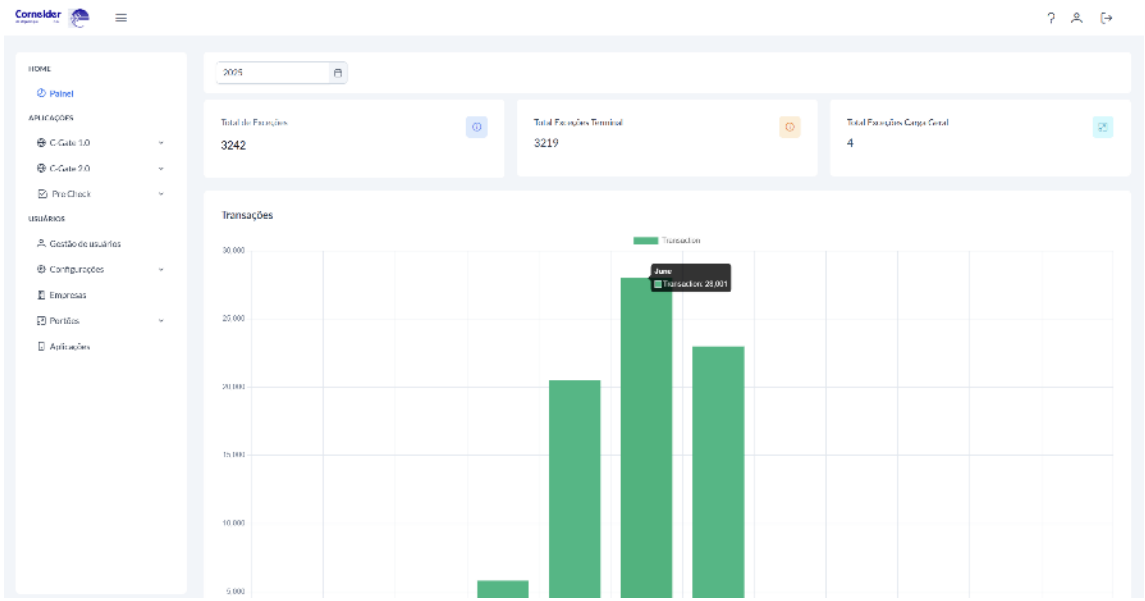
Uses AI, OCR, and LPR to verify:

- Container numbers
- License plates
- Driver identity documents

Supports full gate flow and is fully integrated with Navis N4







Terminal Flow

Turning Real-Time Data into Smart Terminal Decisions

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Terminal Flow – Purpose and Objective

- **Its core purpose:**
  To deliver real-time visibility, precision, and control over all container and equipment movements within the terminal.
- **Why it matters:**
  By being **fully integrated with our TOSs (Navis N4 and CommTrac)**, Terminal Flow becomes the most powerful tool to:
  - **Reduce errors** from manual or unverified movements
  - **Boost productivity** of machines and operators
  - **Increase yard utilization** through optimized job flow
  - **Enable proactive decisions** via live operational data
  - **Ensure traceability** with a digital record of every move
  - **Support future automation** with AI-ready infrastructure

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Terminal Flow - Modules

Module	What It Does
Equipment Control (CT)	Tracks all container terminal machines in real time. Helps allocate work, monitor fuel use, and see performance by shift.
Equipment Control (GCT)	Follows shunting trucks and bulk cargo machinery. Shows live movement and site activity to improve job coordination.
Reach Stacker Assist	Gives operators clear instructions and live maps. Uses cameras and GPS to ensure containers are placed correctly.
Terminal Tractor Assist	Guides tractor drivers through each job. Tracks container moves and helps reduce waiting times with better handovers.

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Terminal Flow – Modules

Module	What It Does
STS Assist (CT)	Helps crane operators work safely and efficiently. Tracks every lift and links to job data. Adds OCR for better tracking.
STS Assist (GCT)	Monitors bulk cargo operations. Uses cameras to detect delays and track truck presence under the hoppers.
Resource Management	Keeps a full record of all equipment and workers. Manages shifts, subcontractors, training, and access.

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Terminal Flow - Equipment Control – (CT)

Functionality:

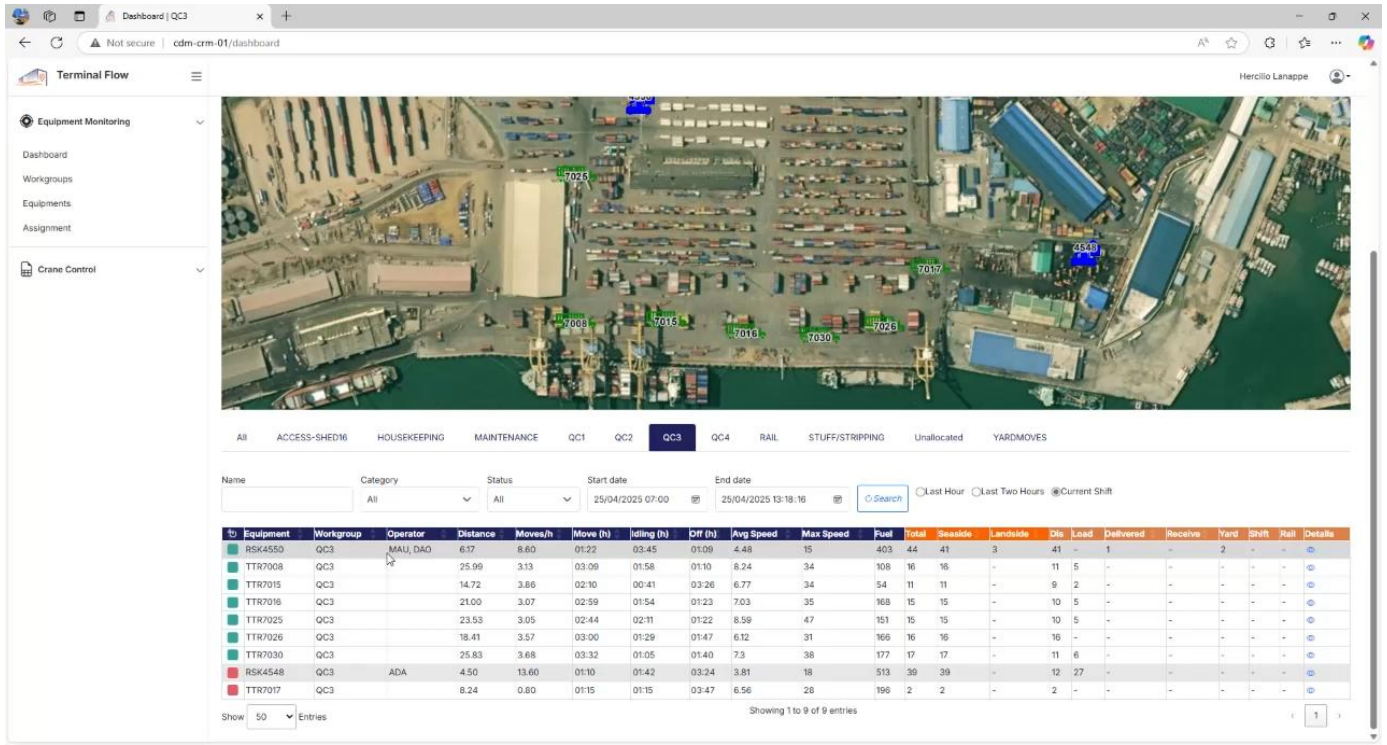
- Monitors cranes, yard equipment and operations. Shows performance by shift, fuel usage, and activity zones.

Smart Feature:

- Provides live dashboards, integrates GPS data, and supports automated task assignment.

Versions:

- v1.0: Real-time tracking & job reports
- v1.5: Work queue views, heatmaps, cameras
- v2.0: Auto dispatch & analytics



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Terminal Flow - Reach Stacker Assist

Functionality:

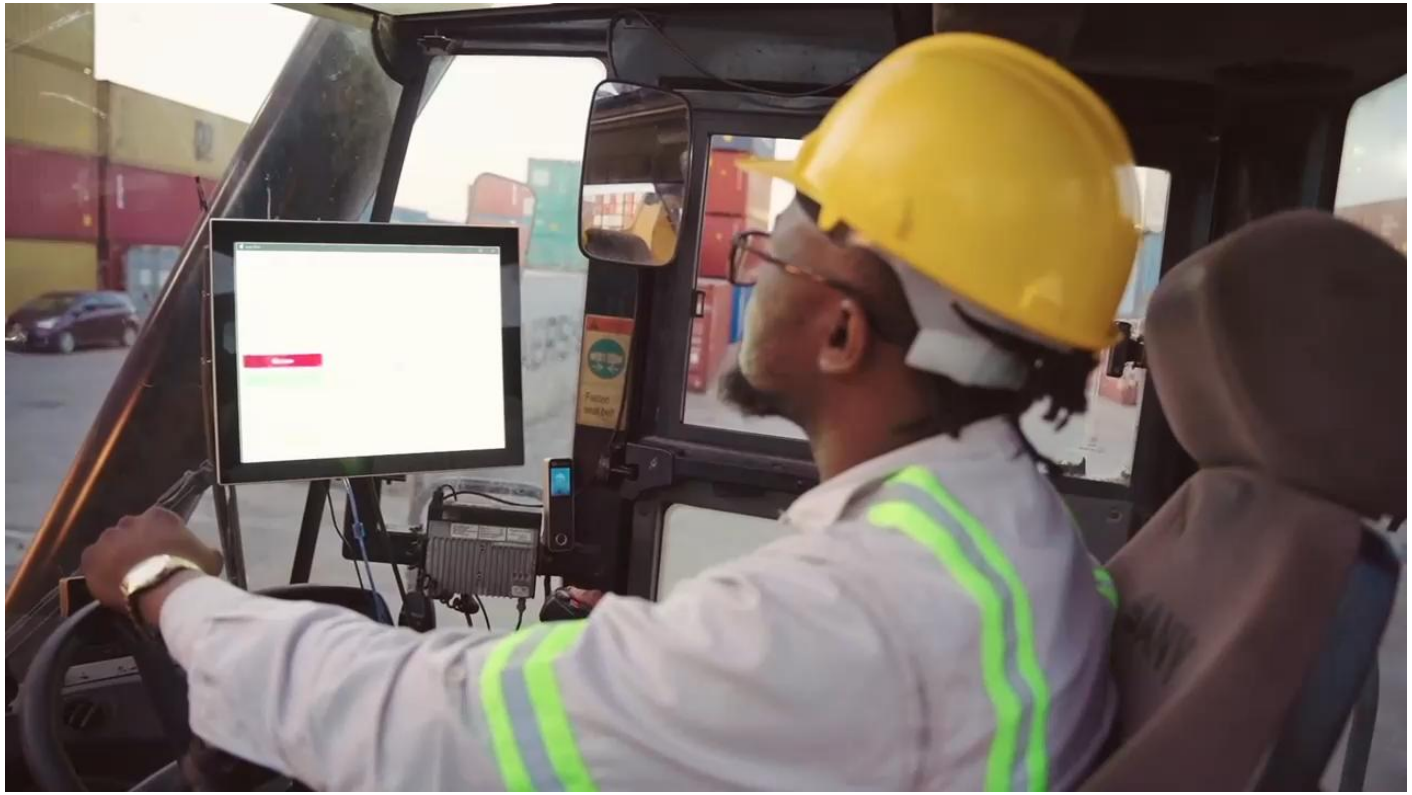
- Helps operators follow tasks with live maps and cameras. Prevents misplacement using GPS and AI.

Smart Feature:

- Guides precision container placement and validates container IDs using OCR technology.

Versions:

- v1.0: Job list, slot view, OCR validation
- v1.5: Camera integration
- v2.0: Auto handover & voice chat



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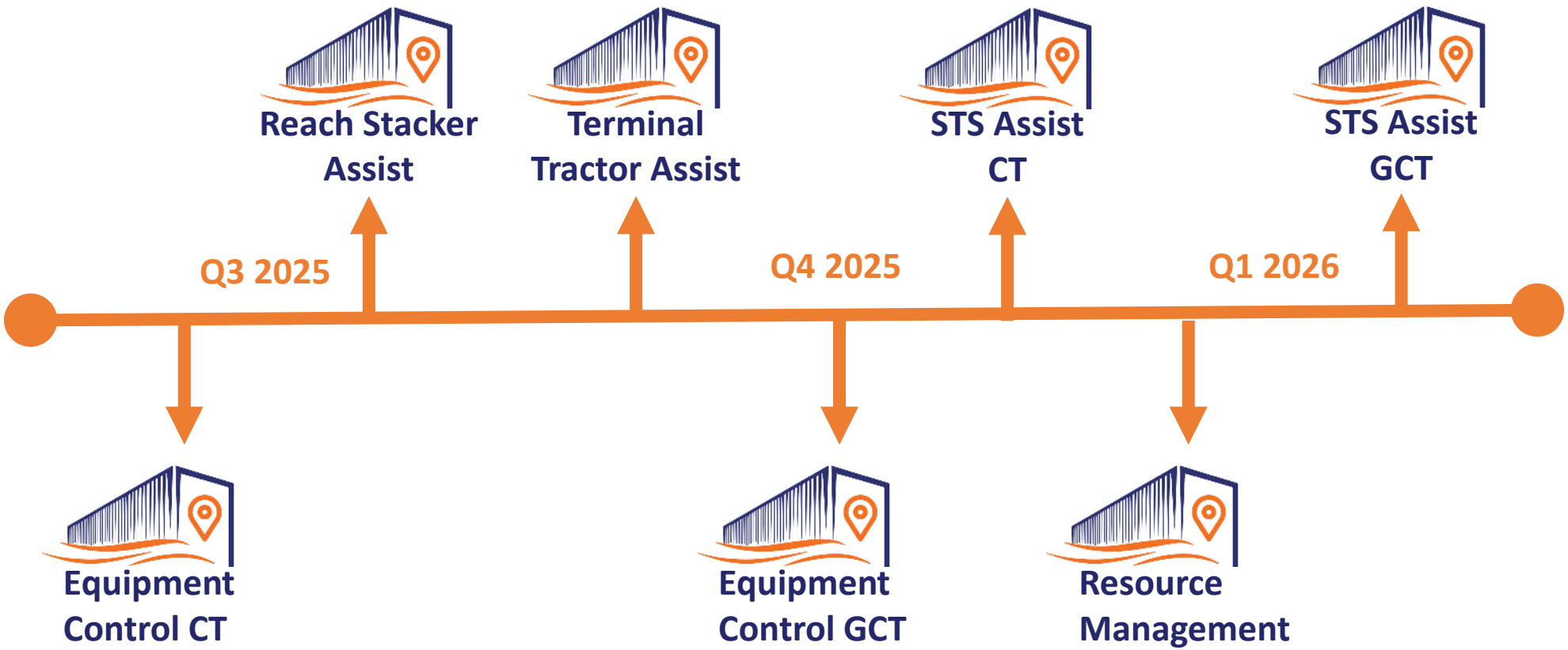
Terminal Flow – Roadmap



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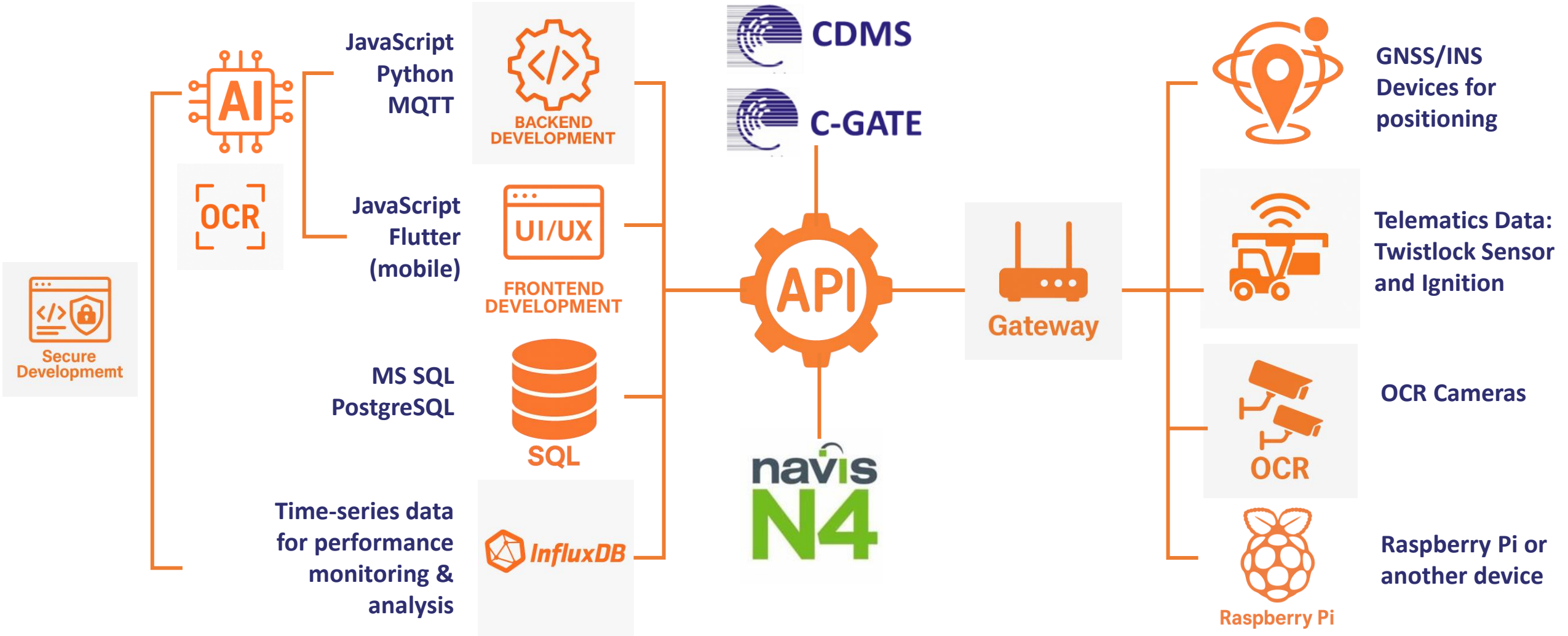
Terminal Flow - Tech Stack & Hardware



Empowering People

People Are at the Center of Our Digital Transformation

- Our innovations are designed not to replace people, but to empower them with the best tools to perform better.
- Every digital solution is built with and for the people who operate the terminals.

Key Roles People Play in Innovation at the Port of Beira

- Operators
- Supervisors
- Gate and Yard Teams
- Developers & IT Analysts
- Management
- Clients & Suppliers

Smart Port Transformation – What's Required

- Leadership committed to innovation and long-term strategy
- TOS in place (e.g., Navis N4 or CommTrac), ready for integration
- Custom tools tailored to local operational needs
- Reliable infrastructure with strong network and accurate data capture
- Agile, skilled development teams able to adapt quickly
- Cross-functional collaboration between Operations and IT
- User engagement and continuous training to drive adoption
- Actionable, high-quality data through strong data strategy

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Conclusion: On the Right Path to Smart Port

Where We Are Today

- Through systems like CDMS, C-Gate, and Terminal Flow, we are digitizing key operational layers and empowering our people to do smarter.

Challenges Still Ahead

- Evolving needs for data standardization and interoperability
- Continued equipment and sensor integration
- Scaling innovation across both terminals

But Our Direction Is Clear

- With each system we build, we move closer to becoming a reference port in Smart Port Transformation, not only in Mozambique, but in the African region.

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Thanks!

Built in Mozambique. Powered by our people. Designed for the future.

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