TOC Europe 2025

Smart Port Operations with Next-Gen Real Time Location Services

Integrating Emissions Monitoring, Engine Diagnostics, Smart RFID

AI-First RTLS System Powering Port Automation

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About IGO Solutions

AI-First Innovation Partner for Port & Logistics Operations

Founded
19+ years across Australia, UAE, UK, NZ & India

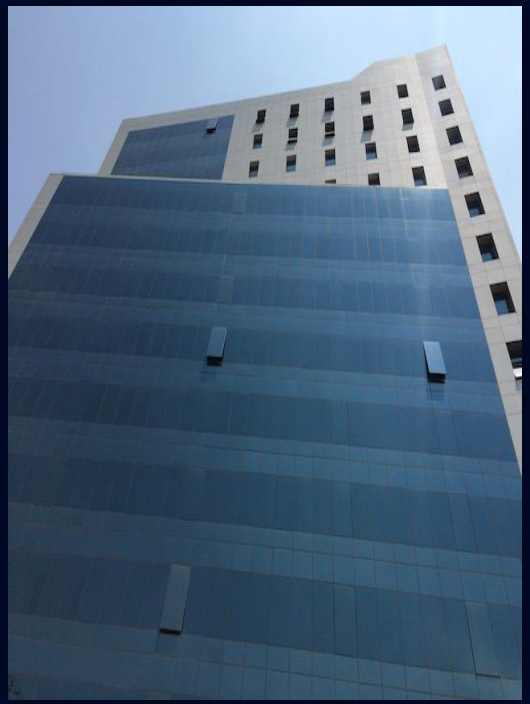
Solutions
Proven suite tailored to port pain points

Innovation
AI-led disruptor with Lidar, RFID & automation tech

Expertise
700+ man-years in ports, shipping & logistics

Global Reach
Projects executed in Europe, Middle East, Africa & Asia-Pacific & India

Team
80+ experts. New 350-seat center in Trichy, India by 2027



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Jay Pandya
Co-CEO, IGO Solutions

Leads the execution of IGO Solutions' medium- and long-term strategy, ensuring the company delivers innovation and operational excellence at scale.

Oversees mission-critical projects that drive customer value at the core of terminal operations.

A recognized expert in port automation, has played a pivotal role in modernizing terminals including:

- **Euromax (Rotterdam)**
- **Abu Dhabi Terminal**
- **London Gateway**
- **Victoria International Container Terminal**
- **Ports of Auckland**

He is also the driving force behind several flagship IGO products now deployed across leading global ports.

Holds a degree in Computing from the University of Wales and an MBA from Macquarie University, NSW, Australia.

AI's impact on Container Terminal Operations

1 Yard and Berth Optimization

- AI-driven algorithms analyze historical and real-time data to optimize
  - Yard planning: Efficient Container Stacking and retrieval
  - Berth Allocation: Assigning the best berths to incoming vessels

2 Predictive Maintenance

- IOT Sensors + AI monitor equipment like:
  - Ship-to-Shore Cranes (STS)
  - Yard Cranes (RTGs, RMGs, ASCs)
  - Automated Guided Vehicles (AGVs)
  - Straddle Carriers
- ML models detect anomalies and predict key component failures

3 Automated Equipment Control

- AI is a key enabler in autonomous operations
  - Automated Guided Vehicles (AGVs) and automated cranes use of AI for navigation, collision avoidance and task optimization.
  - Computer Vision systems help detect container numbers and alignments

4 Container Tracking and Inventory Management

- AI improves real-time tracking using data from:
  - RFID
  - IoT Sensors
  - Video Analytics
- Enables better inventory accuracy, container dwell time prediction, and asset utilization

5 Vessel Arrival and Departure Prediction

- AI Forecasting tools predict vessel ETA/ETD using
  - AIS data (Automatic Identification Systems)
  - Weather patterns
  - Port Congestion
- Helps in resource planning and scheduling

6 Gate Operations and Security

- AI-based license plate recognition (LPR) and facial recognition streamline gate-in/gate-out processes.
- Enhances terminal security by flagging unusual activity or unauthorized access

7 Energy Optimization

- AI helps terminals become greener by:
  - Optimizing energy usage of cranes and lighting.
  - Managing electric vehicle (EV) charging schedules.
  - Predicting and reducing carbon footprint.

8 Decision Support Systems

- AI supports control tower operations by:
  - Recommending reallocation of resources during disruptions.
  - Running "what-if" scenarios for contingency planning.
  - Enhancing collaborative decision-making between terminal operators and shipping lines.

9 Digital Twins

- AI continues to Enhance the Digital Twin Models of Terminals:
- Simulate terminal Behavior under different Scenarios
- Optimize throughput and Minimize bottlenecks

10 Workforce Management

- AI forecast labour demand and assists in crew scheduling, factoring
  - Historical Patterns
  - Ship Arrivals
  - Weather Conditions

The Need for Advanced AI-based RTLS

Traditional RTLS

- Basic Location Tracking/ Arrival Notification/ Job Promotion
- No Predictive Maintenance
- Fuel Inefficiencies
- Data Silos
- Inaccurate Sustainability Reporting

Next Gen AI-RTLS

- Real-Time Emissions Monitoring Using PEMS and AI Predictive Models
- Optimized Routing, Job Assignment & Monitoring (Fuel savings, reduced congestion, faster TAT)
- Predictive Maintenance (Engine diagnostics & AI-driven alerts)
- AI-Powered Insights (Smarter decision-making for container handling & workforce)

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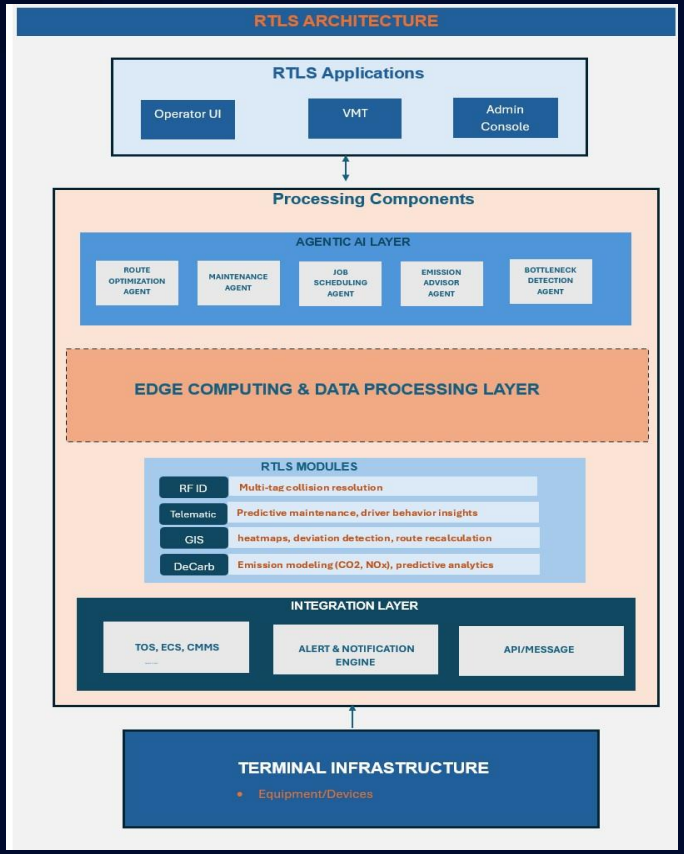
Agentic AI-RTLS Architecture

- AI Agents are autonomous systems that can perceive, reason, and act independently to achieve specific goals. AI agents can:
  - Plan and execute multi-step tasks
  - Use tools and interact with external systems (such as external APIs, codes, programming languages)
  - Adapt their approach based on results
  - Operate with minimal human intervention
- Agentic Workflow Paradigm includes AI-driven independent actions to achieve a specified goal



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Current RTLS Limitations

- Existing RTLS solutions (GNSS + RFID) provide location tracking but lack operational intelligence

- Challenges faced by terminal operators:
  - Fragmented asset intelligence
  - Unplanned downtime
  - Inefficient equipment utilization
  - No emissions tracking
  - Data silos and limited AI-driven insights

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Introducing Next-Gen AI-RTLS

The new AI-RTLS framework goes beyond tracking, integrating:

1. Portable Emissions Measurement System (PEMS) – Direct emissions tracking
2. Engine Diagnostics – Real-time monitoring & predictive maintenance
3. Edge Enabled RFID Computing – Smarter Readers for intelligent and latency free operation monitoring & control
4. AI & Analytics Engine – Data-driven decision-making for optimization
5. Microservices-Based Architecture – Scalable, future-proof system

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Next-Gen AI-RTLS – Portable Emissions Monitoring (PEMS)

Real-time Operation emissions reading and Data Modelling, instead of indirect rough emission estimates

Identifies **specific activities and equipment** contributing to high emissions

Helps meet **regulatory compliance and sustainability goals**

Reduces Carbon footprint more precisely & efficiently and provides **accurate ESG reporting**

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Engine Diagnostics

- Advanced Telematics Devices tracking Key engine parameters (temperature, oil pressure, rpm, fuel consumption)
- Predictive maintenance model reduces breakdown costs, increases equipment uptime and extends asset life
- Business Impact: Reduces unplanned downtime significantly and increases equipment utilization time
- Congestion Management and Auto-routing
- Driving Violation and Fatigue Alerts

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Edge Enabled Intelligent RFID

- Edgeware Enabled Readers perform intelligent operations by localizing decisions, reducing response latency
- Dual tag identification to reduce cost and faster onboarding (Country specific tags or Port tags). For e.g. Fastag in India – Port can use port Tags whereas External Trucks can use country specific tags
- Microservice Architecture Design ensures application reliability, performance and scalability
- Business Impact: Enables faster responses to exceptions corrections and handling

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AI-First Intelligence Layer

- **AI-Powered Traffic Orchestration** – Predicts port congestion and reroutes vehicles in real time to avoid bottlenecks.
- **Behavioral Modeling of Cranes and Vehicles** – Deep learning models learn individual machine behavior and flag anomalies pre-failure.
- **Self-Optimizing Operations Loop** – AI loops back operational feedback (e.g. delays, idling, congestion) to iteratively improve job planning.

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What Makes iGo's RTLS AI-First

Legacy RTLS	AI - RTLS
Location data only	Context-Sensitive and predictive
Manual routing	AI-optimized autonomous routing
Reactive maintenance	Predictive and prescriptive Maintenance Alerts
Static rules	Self-improving decision algorithms
Disconnected systems	Federated data and AI-driven orchestration

AI-first RTLS is not an upgrade — it's a foundational shift towards Autonomous Port Infrastructure.

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TOS + AI RTLS = Smarter Together

Feature	Terminal Operating System (TOS)	iGo RTLS AI Co-Pilot
Emissions Insight	Unavailable	Indentification of emissions and preditive Models for Emissions Reduction
Job Assignment	Based on rules and available resources	Validates decisions based on historical data
Movement Optimization	Pre-defined logic	Learns from actual movement patterns for route optimisation
Equipment Utilization	Static rules	Adaptive, ML-optimized Equipment Utilisation

With our AI-first RTLS, ports get the best of both worlds: the structure of a TOS, and the intelligence of a continuously learning system that improves it.

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Next-Gen AI-RTLS – Microservices Architecture

- **Modular & API-first architecture** ensures reliability and scalability
- **TOS and ECS Systems Agnostic**
- Enables **future-proof system upgrades** with no Downtime

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Before vs. After – Impact

Operational Area	Before Implementation	After Implementation
Equipment Uptime	↓ **Frequent Breakdowns** -Reactive repairs causing significant unplanned downtime	↑ **Maximized Availability**-Predictive maintenance preventing failures
Container Movements	↓ **Inefficient Routing** -Excessive repositioning and unnecessary moves	↑ **Optimized Logistics** -Smart routing with minimized repositioning requirements
Fuel Efficiency	↓ **Excessive Consumption** -Inefficient operations leading to wasted fuel	↑ **Resource Optimization** -Intelligent routing and operations reducing fuel needs
Environmental Reporting	↓ **Estimation-Based** -Approximate figures based on calculations, not measurements	↑ **Data-Driven Precision** -AI-powered real-time tracking ensuring compliance
Maintenance Approach	↓ **Calendar-Based** -Fixed schedules regardless of actual equipment condition	↑ **Predictive Intelligence** -Condition-based maintenance preventing failures

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Business Gains

Direct Cost Reduction
- Lower maintenance costs
- Fuel savings
- Improved labour efficiency

Capacity Enhancement
- Higher equipment utilization
- Increase in container moves per hour
- Better space utilization

Competitive Advantage
- Better service levels and sustainability compliance
- Cost leadership through operational efficiencies
- AI-driven strategic planning

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Aligning with Port Operators' Strategic Goals

Sustainability & Emissions Compliance

- Direct emissions tracking enables accurate ESG reporting
- Formation of an Emissions baseline for creating tradeable carbon credits
- AI-driven recommendations for **electrification planning**

Digital Transformation

- Creates a **foundation for smart ports**
- **Digital twins for predictive modelling & automation**

Operational Excellence & Service Leadership

- Improves truck turnaround times and reduces congestion
- Enables **service guarantees based on real-time data**

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In case of any queries, feel free to reach out:

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THANK YOU

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