

Case Mitsubishi Logisnext AGVs:
ROS in perception-based local navigation

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MITSUBISHI LOGISNEXT EUROPE

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Introduction to

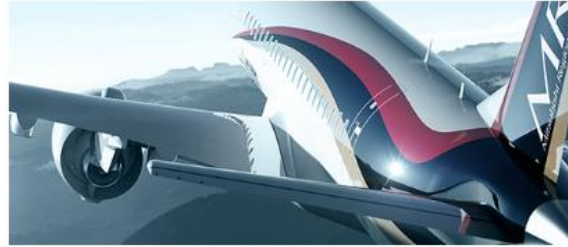
Mitsubishi Logisnext

We are Part of Mitsubishi Heavy Industries

Logisnext



ENERGY >



AIRCRAFT >



SPACE >



SHIP & OCEAN >



TRANSPORTATION >



MATERIAL HANDLING >



ENVIRONMENT >



AUTOMOTIVE >



INDUSTRIAL MACHINERY >



INFRASTRUCTURE >



LIVING & LEISURE >



DEFENSE >



MHI group consists of multiple strategic business units under seven domains:

- Energy Systems
- Nuclear Energy Systems
- Integrated Defence & Space Systems
- Plants & Infrastructure Systems
- Machinery Systems
- Commercial Aviation Systems
- Logistics, Thermal & Drive Systems



12,000+

EMPLOYEES GLOBALLY



3.3 B€

ANNUAL REVENUE



80+

YEARS HISTORY



Standard Market
TOKYO STOCK EXCHANGE



TOP 3
IN INDUSTRY



100,000+
UNITS SOLD in FY2021

VISION:

Moving the world forward as the leading provider of innovative logistics and material handling solutions



Introduction to

Logisnext Solutions



Mitsubishi Logisnext Europe (MLE) has an unparalleled experience in the intralogistics automation.

Our background is in **Rocla Automated Guided Vehicle (AGV) Solutions:**

- 40+ years of experience.
- Over 8,000 AGVs.
- Over 2,000 projects worldwide.
- Global operations through a wide ML and partner network.

1983

The first delivery of an AGV system

2009

AWT, a Very Narrow Aisle AGV

2011

AWTh, a heavy-duty vehicle

2016

Route Optimizer, deadlock-free dynamic routing

2020

FleetController, AGV system controller

Late 50's

Introduction of the first industrial AGV systems

2007

Introduction of AWT, the first modular AGV design concept

2010

ATX, pallet mover family

2015

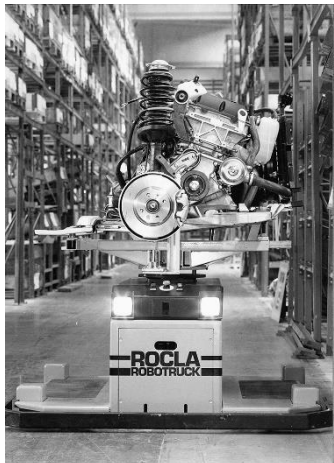
Launch of large-scale dealer partnership with Aprolis

2019

Establishment of US Business Hub in co-operation with Logisnext Americas. ART, Automated Reach Truck

2021

Launch of Logisnext Solutions as a provider of comprehensive logistic solutions. Opening of the Demo Center



Global Services:

- Full service portfolio scalable according to customer demands.
- Customer support through 24/7 helpdesk.
- On-site support through 35 subsidiaries and over 1,000 dealers worldwide.

Logistic Solutions

MLA

Mitsubishi Logisnext Americas:

- Direct Sales
- Partner Network
 1. Global & Local integrators
 2. MLA Network

MLE

Mitsubishi Logisnext Europe:

- Direct Sales
- Partner Network
 1. Global & Local integrators
 2. MLE Network

ML

Mitsubishi Logisnext:

- Direct Sales
- Partner Network
 1. Global & Local integrators
 2. APAC Network



Our Vision: Optimal Automation

Logisnext Solutions



Mixed Fleet

Humans

- > Prone to errors
- > Tend to fatigue
- > Unpredictable



- > Flexible & adaptive
- > Creative & intuitive
- > Handy & skilful



- > Predictable & tireless
- > Safe & reliable
- > Productive & efficient

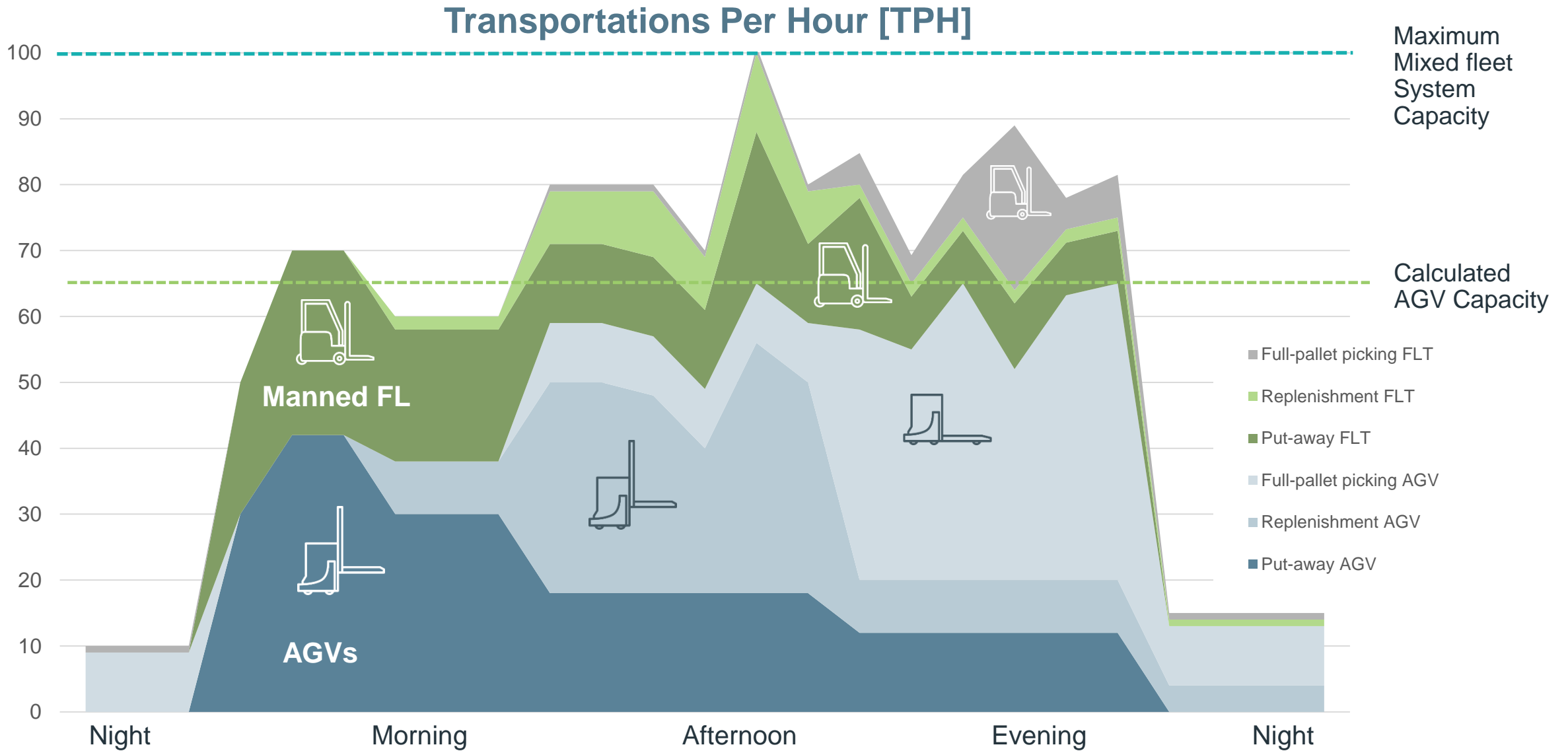
Robots

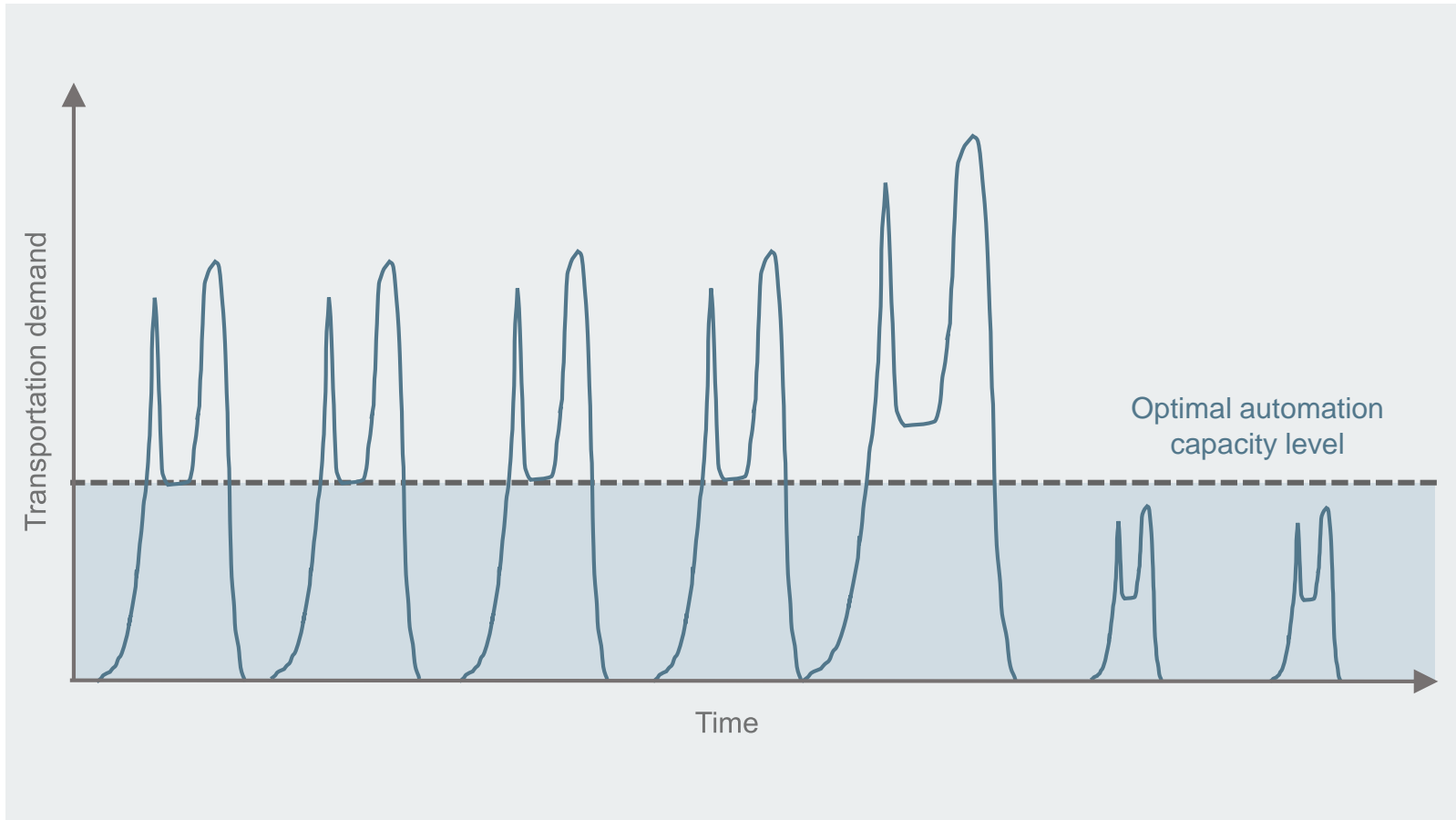
- > Don't do creative problem solving
- > Non-intuitive

---> Human workforce can focus on more motivating tasks

---> Robots can handle repetitive tasks more efficiently

Mixed Fleet Solution: Optimal Automation





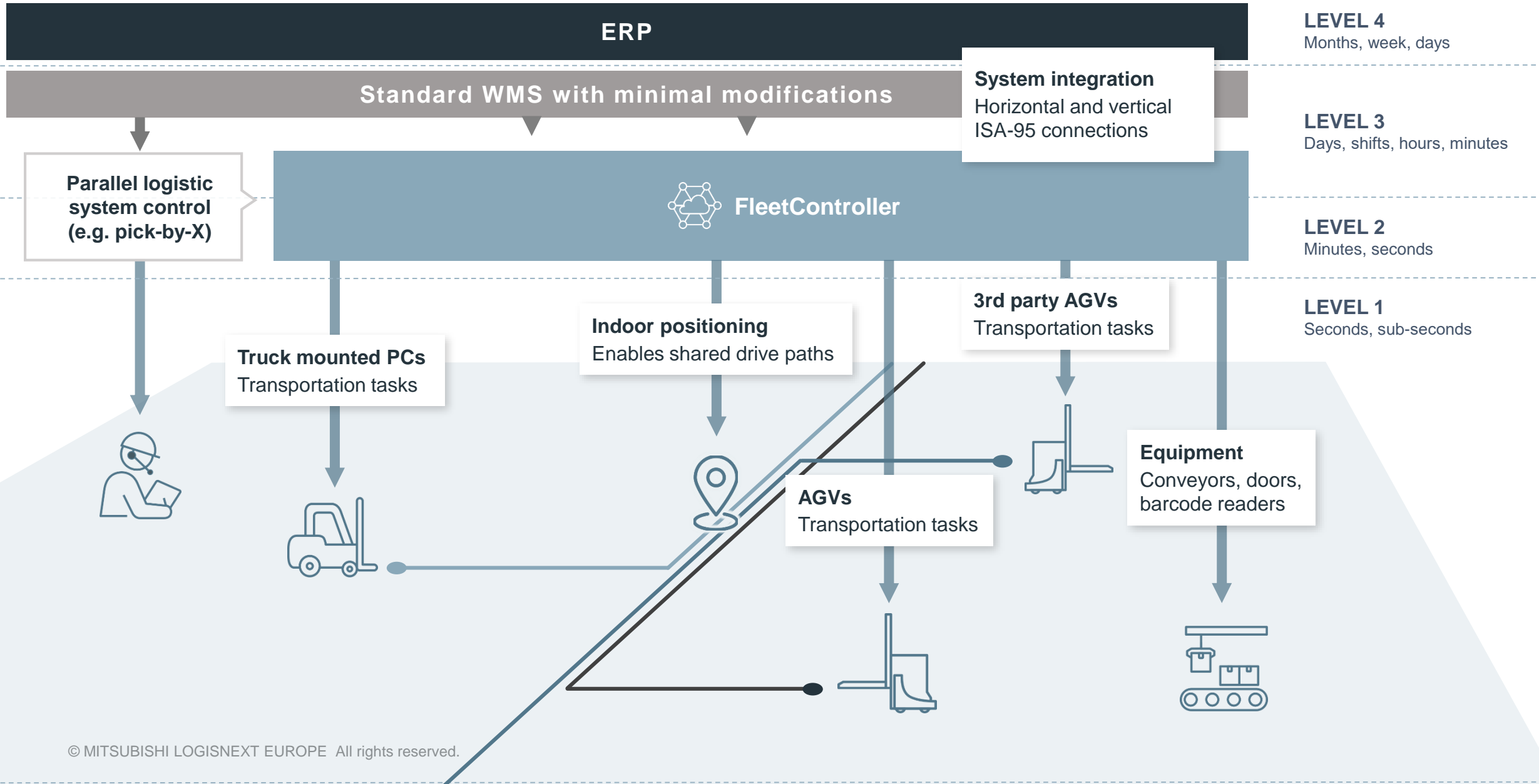
Normal variation in the transportation demand

- Peak vs. average demand
- How many shifts per day
- Seasonal changes







Continuously changing environment

- New material flows
- Bottlenecks in the layout or transportation demand

Seamless Collaboration



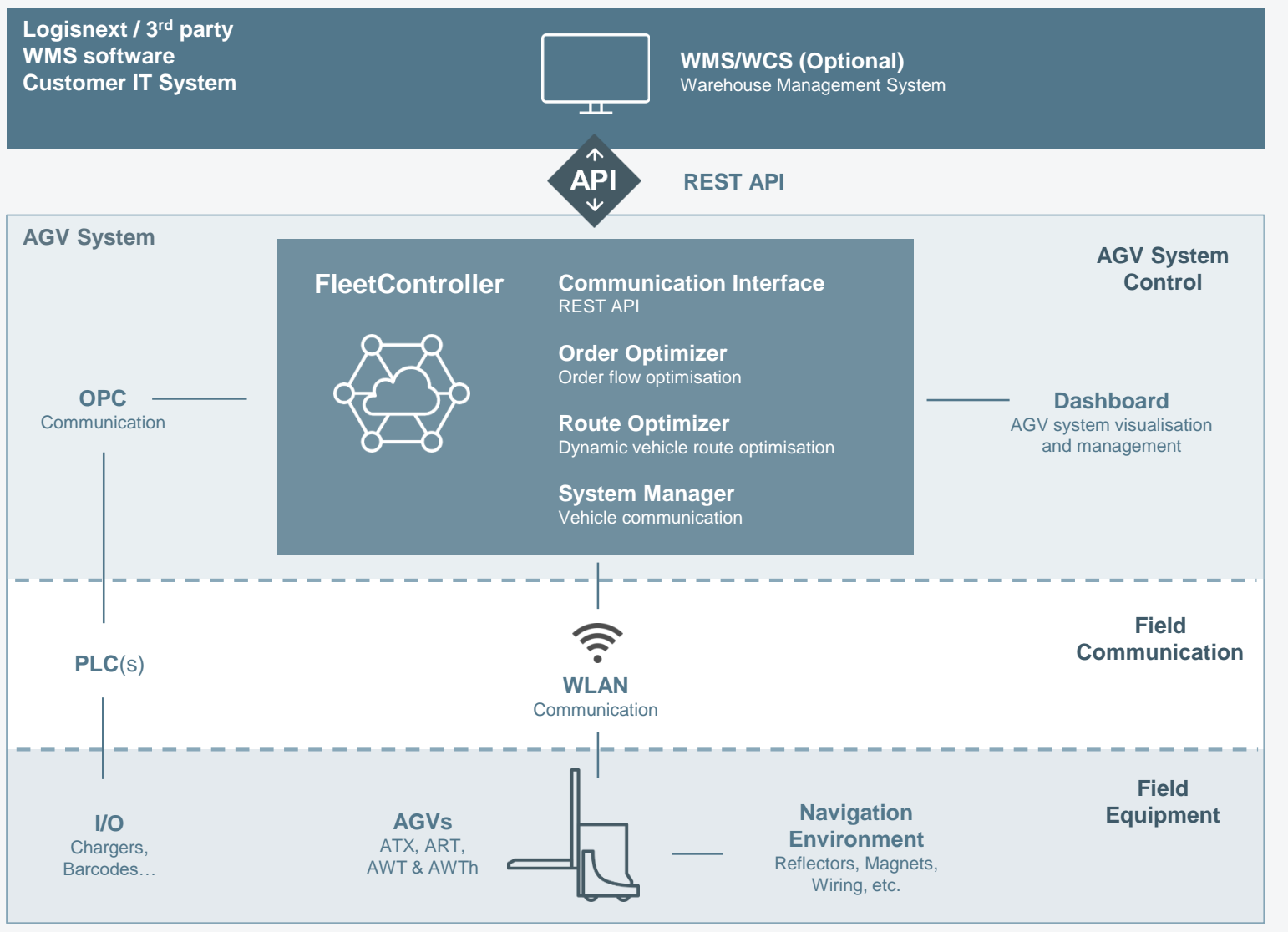
Mixed Fleet Levels

Mixed fleet levels	 0 Isolated	 1 Co-existing	 2 Co-operating	 3 Collaborating	 4 Optimizing	 5 Self-learning
	State-of-the-art in logistics industry	Complementary automation	Logisnext 2022 Flexible capacity	Orchestrated automation	Logisnext 2023 Assisted optimal driving	To infinity and beyond Level of Human-Automation Interaction
Customer benefit in a nutshell	Automation in specific process	Automation applicable in sub-processes	Right-sized investment and flexible capacity	Focus on complete material flow efficiency	Optimized process efficiency	Continuously optimizing



Case Pallet Finder

ROS in perception-based
local navigation



The AGV system software:

- Connects WMS/WCS/WES/ERP with AGVs.

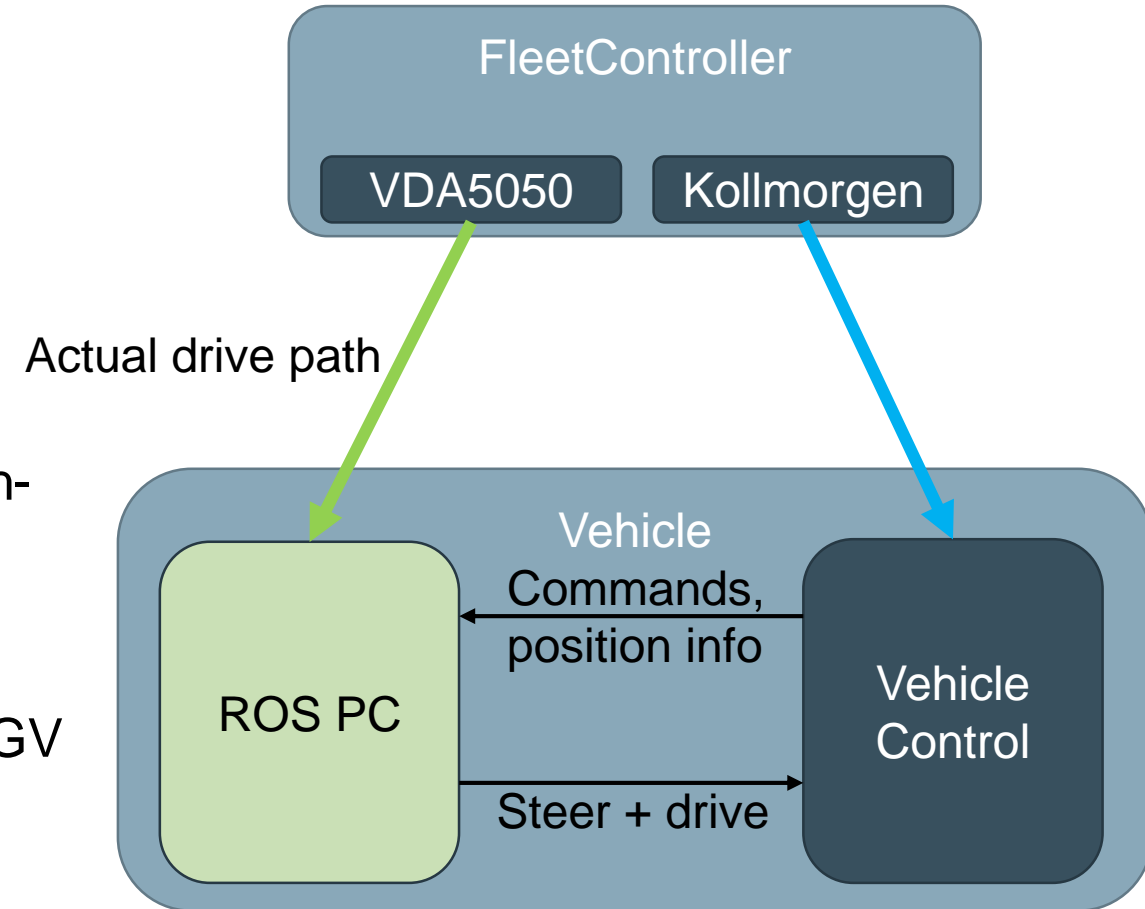
Tailor-made intelligence:

- Continuous computing to maximise transport capacity.
- Optimisation logic scales automatically to material flow demands.

Integration:

- Connects to WMS with REST API, a widely used way to integrate systems.
- Manages the AGV fleet according to WMS orders.
- Interacts with the site and surroundings through various technologies, such as barcodes or I/Os.

- Traditional Kollmorgen load-handling interfaces are used to send operation parameters and codes to vehicle
- Vehicle controller listens to steer and drive inputs from ROS PC
 - Kollmorgen guidance-loop replaced by a path-following controller, with paths generated by a path-planner in FleetController.
 - PalletFinder results from individual lidar scans are sent over CAN-bus
 - Kalman filter applied to both pallet estimate and AGV location, where the all measurement results are affecting the overall estimate

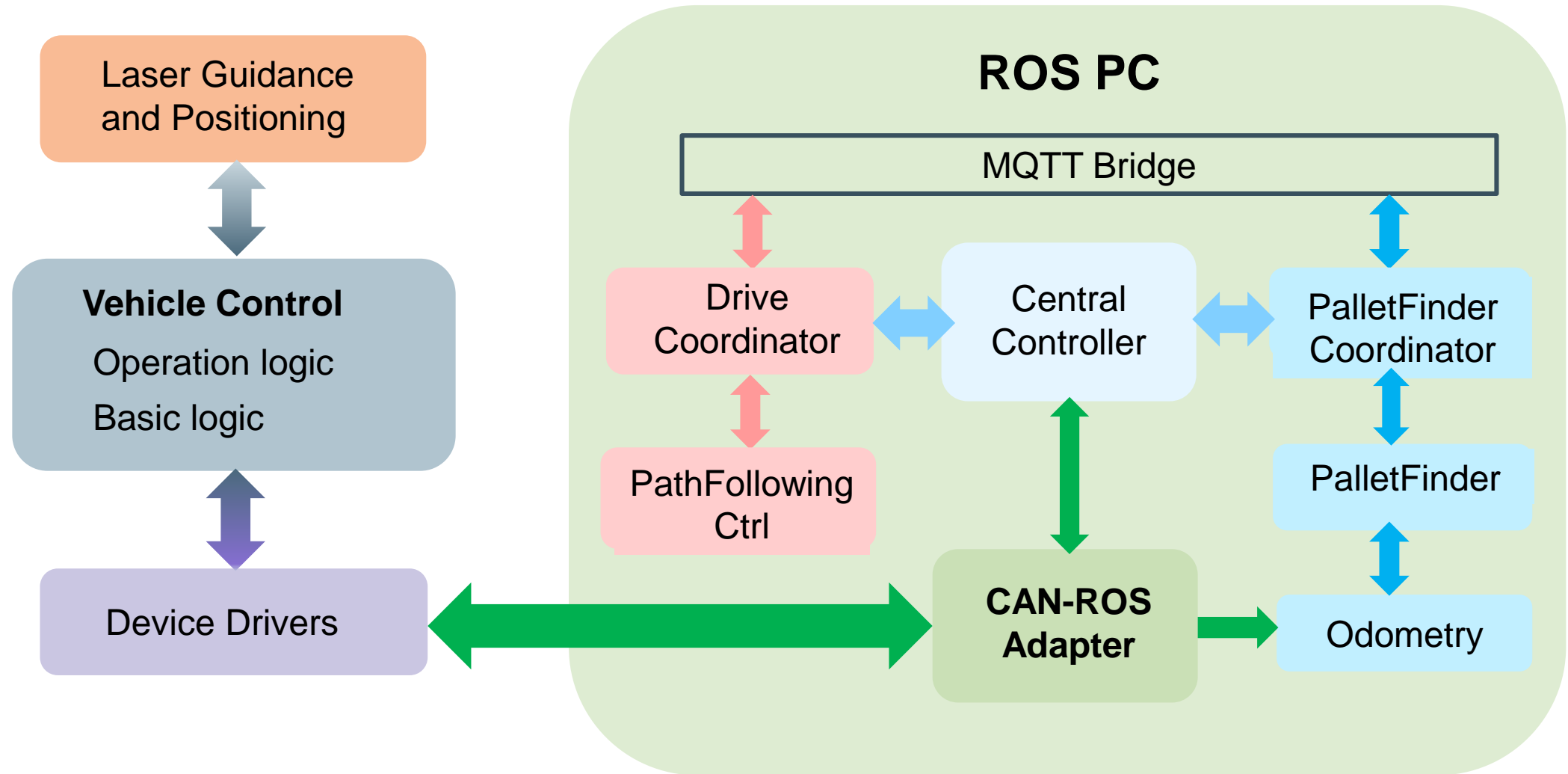


ROS in perception-based local navigation



ROS in perception-based local navigation





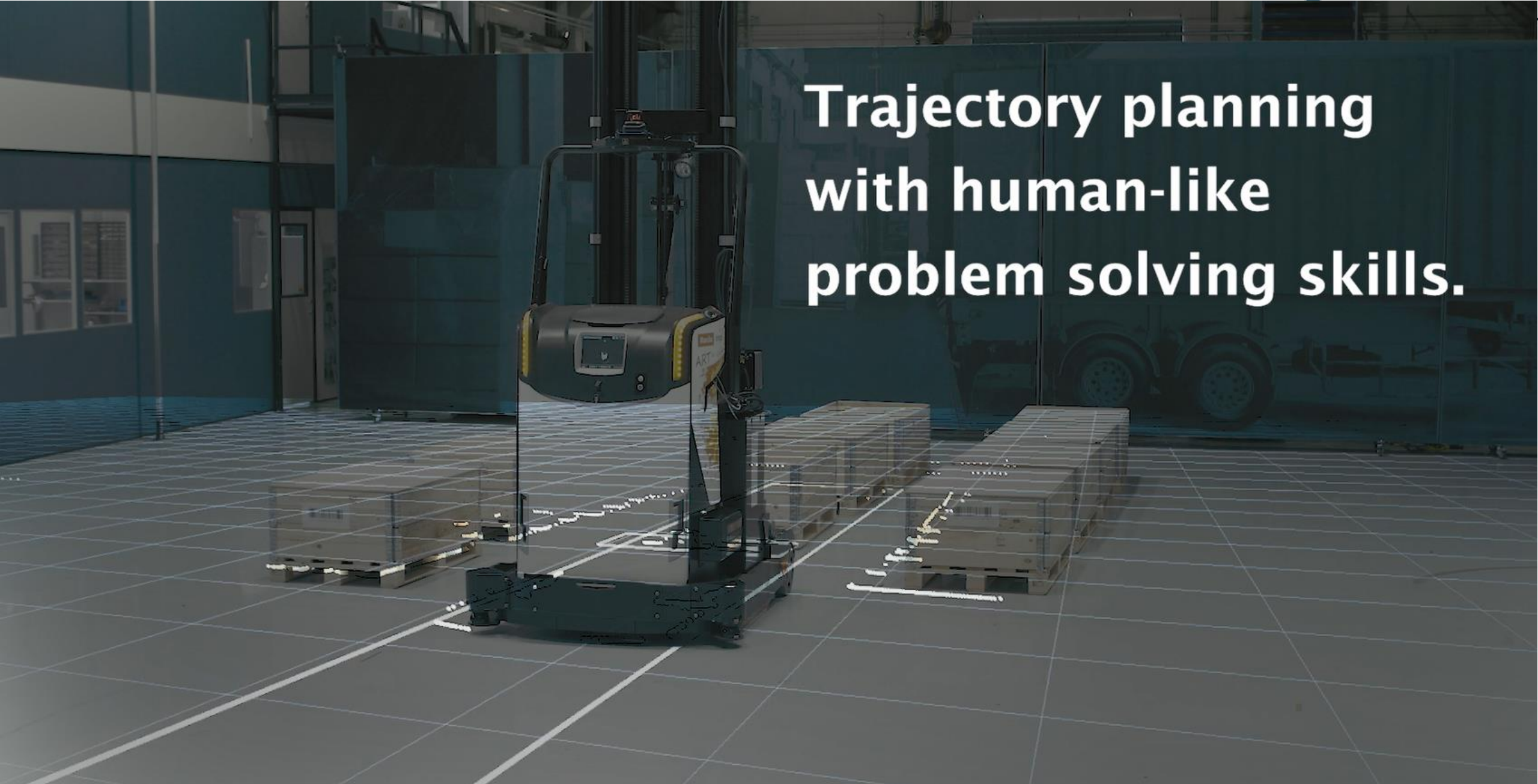


Human-Machine Collaboration



[Video](#)

**Trajectory planning
with human-like
problem solving skills.**



WHY

Business Case: Interoperability

HOW

Enables: Fast and Agile R&D

WHAT

Result: Automatic becomes Autonomous

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