

Wisematic ⁰¹⁰¹⁰¹

a byte more automation

& MiR Mobile Robots Presentation 28.5.2021



Wisematic: history & today

- Founded 2005
- Spin-off from Tampere University of Technology
- Headquarters in the high tech center of Hermia in Tampere region in Finland
- Turn-over: ~1,6m€ (2020)
- Head count: 14



Focus

Create automation solutions

- For uncatered needs
- For mini/medium size parts
- Requiring flexibility and performance



Mission

**Enable
competitive and profitable
Nordic operations
with automation and robotics.**

Offering

PRODUCTS & PLATFORMS

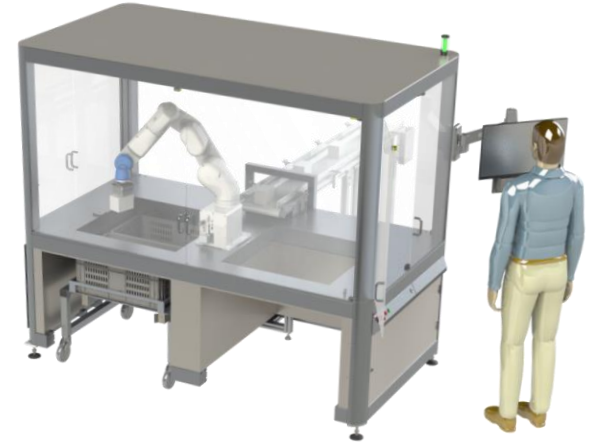


SERVICES



- SW
- MECH
- UI
- SYSTEM
- CTRL
- MACHINE VISION
- INTEGRATION
- SAFETY

SOLUTIONS



TURN-KEY SYSTEMS

INSTALLATION

TRAINING

SERVICE

Portfolio

BRANDS

EPSON
EXCEED YOUR VISION

TECHMAN

MIR
A BETTER WAY

Onrobot

octant

SOFT ROBOTICS **CAJO**
TECHNOLOGIES

CUSTOMERS

SUUNTO

SCANFIL

VAISALA @ENICS

OptoFidelity

CARGOTEC

BRITISH AMERICAN TOBACCO

S GROUP

SANDVIK

ETA

APPLICATIONS

ASSEMBLY

JOINING

SORTING

DISPENSING

HANDLING

TENDING

FEEDING

MARKING

PALLETIZING

LABELING

INSPECTION

PACKAGING

TESTING

LOGISTICS

...AND YOUR
APPLICATION TOO!

MiR | a better way

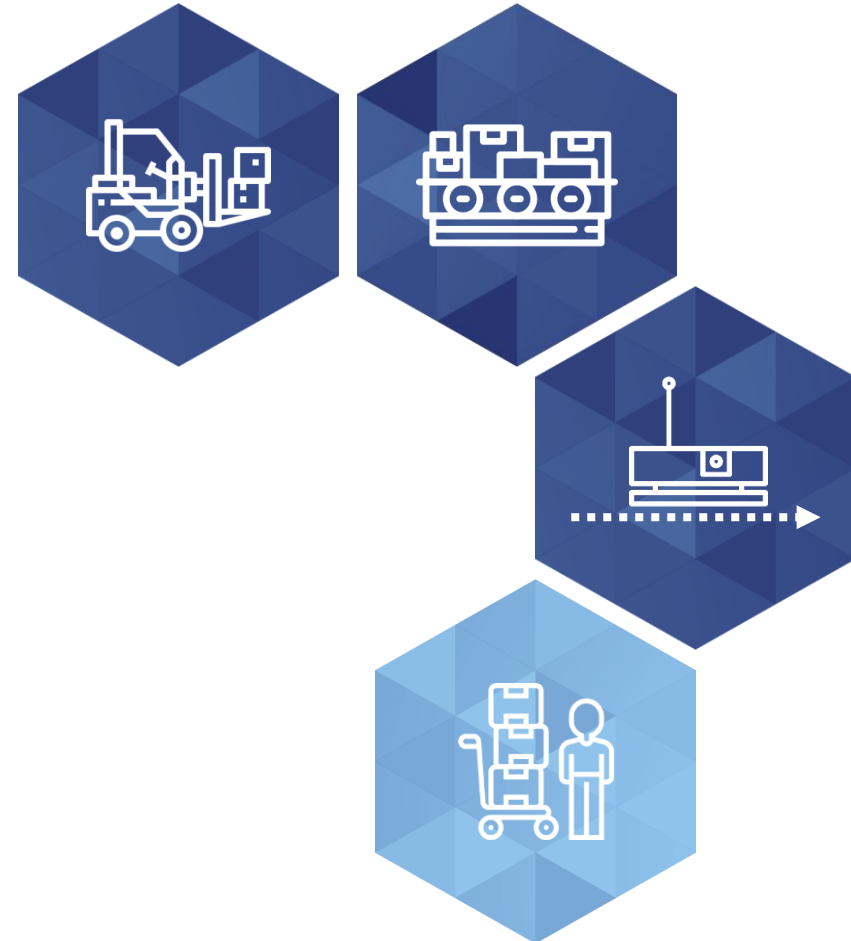
MiR

Internal Logistics So Far

Internal logistics consume large amount of resources that do not contribute directly to your value creation

Today internal transportation is usually done by:

- ▶ Manned forklifts
- ▶ Static conveyor systems
- ▶ AGVs
- ▶ Usage of special designed trolleys or racks



Megatrends That Affect Internal Logistics

Automate internal logistics

Megatrend

Globalization of markets

Effect

Rapid growth of new economies and new business models

Concern

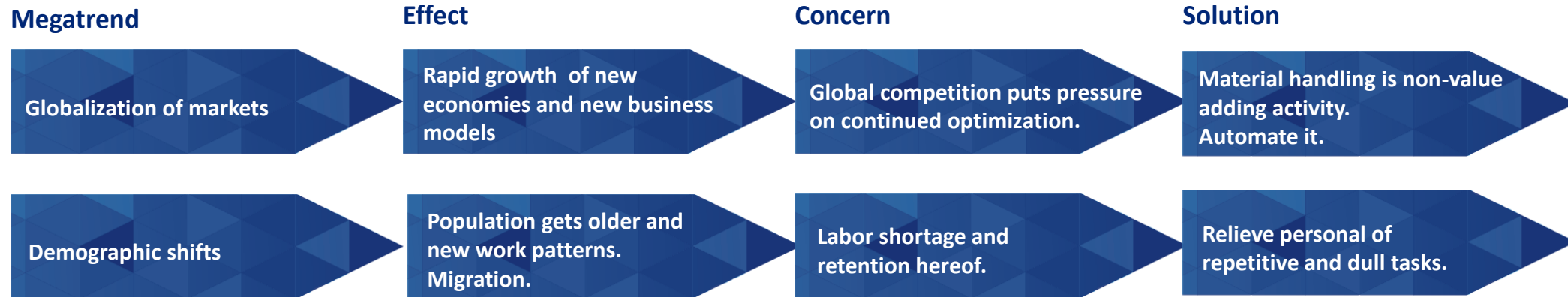
Global competition puts pressure on continued optimization.

Solution

Material handling is non-value adding activity. Automate it.

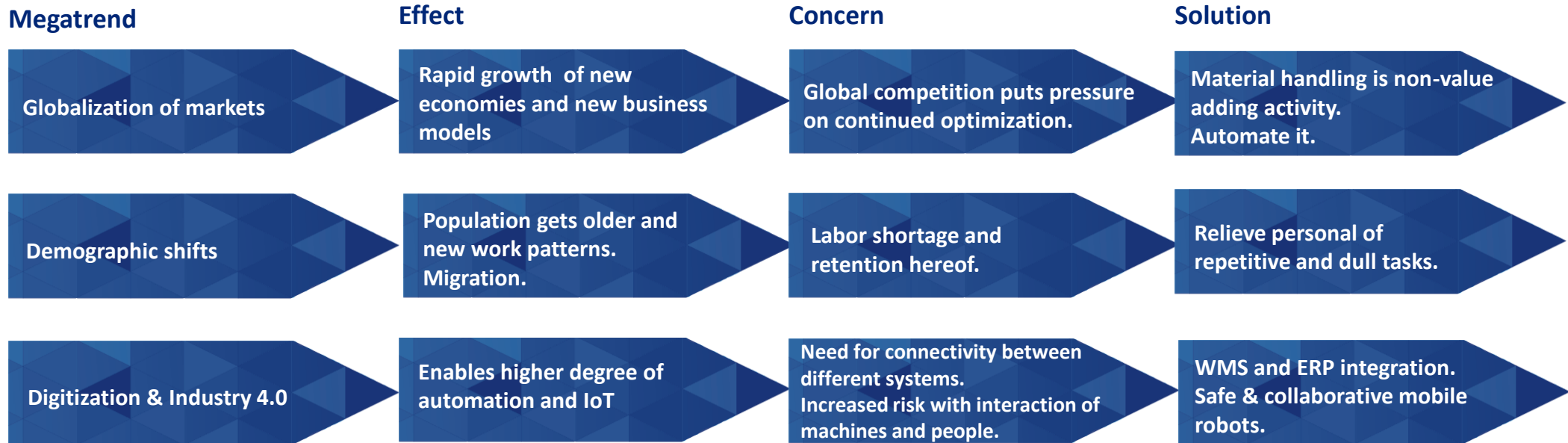
Megatrends That Affect Internal Logistics

Automate internal logistics



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Automate internal logistics



Megatrends That Affect Internal Logistics

Automate internal logistics

| Megatrend | Effect | Concern | Solution |
|-------------------------------------|--|--|--|
| Globalization of markets | Rapid growth of new economies and new business models | Global competition puts pressure on continued optimization. | Material handling is non-value adding activity. Automate it. |
| Demographic shifts | Population gets older and new work patterns. Migration. | Labor shortage and retention hereof. | Relieve personal of repetitive and dull tasks. |
| Digitization & Industry 4.0 | Enables higher degree of automation and IoT | Need for connectivity between different systems. Increased risk with interaction of machines and people. | WMS and ERP integration. Safe & collaborative mobile robots. |
| Individualization of consumer needs | Mass customization production setups with higher variety and smaller batches | High switching cost and non-flexible solutions | Engage with an adaptable, scalable, and open platform setup. |

A Better Way

The MiR Value Proposition

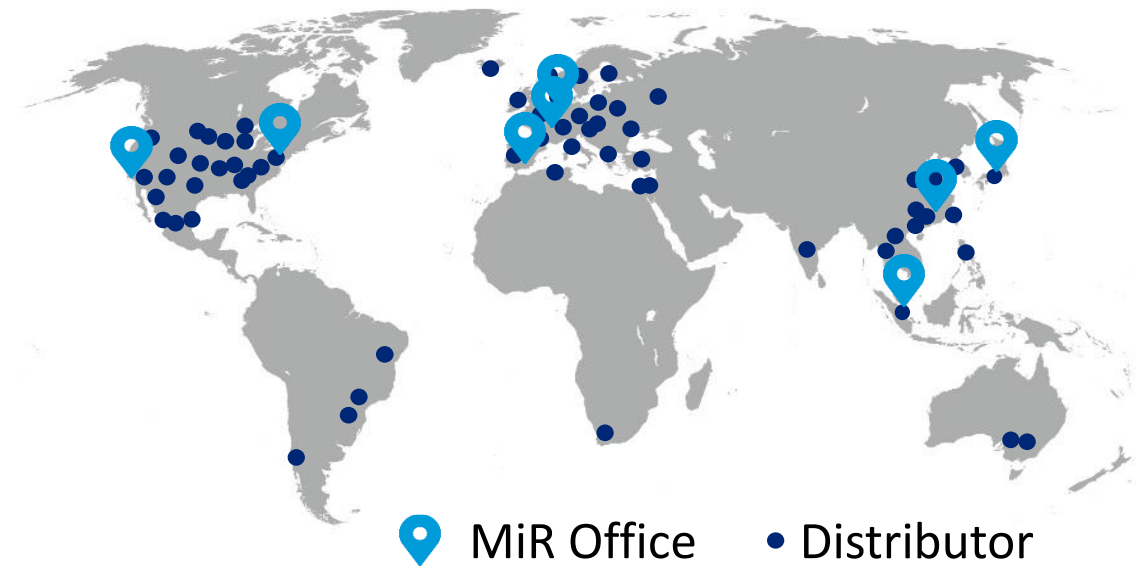
With the world's most safe and reliable autonomous mobile robot, MiR is a market-leader dedicated to fully optimizing the efficiency and productivity of your internal logistics. Everything we do is driven by our ingenious take on collaboration, adaptability and performance.



The Company Today

MiR Highlights:

- ▶ 220 employees focused on rapid development and growth:
 - ▶ 30% in R&D
 - ▶ 47% in Sales & Technical Support
 - ▶ 10% in Production
 - ▶ 14% in supporting functions
- ▶ 100 new employees hired last 12 months
- ▶ Born global: 176 distributors in 50 countries
- ▶ Local presence: Offices in New York, San Diego, Barcelona, Shanghai, Tokyo, Frankfurt and Singapore
- ▶ Award-winning technology: Winner of multiple international renowned awards



>5000 robots
sold globally

Automating Internal Logistics

Differences in AGV vs. AMR



AGV Automated Guided Vehicle

- ▶ Requires "tracks" – e.g. magnetic stripes in the floor or wires
- ▶ Stops at any obstacle without possibility to change route
- ▶ Expensive and time consuming to expand/change work area
- ▶ Restricted to fixed routes and controlled sequence



AMR Autonomous (collaborative) Mobile Robot

- ▶ Trackless, autonomous navigation
- ▶ Travels safely around people and obstacles
- ▶ Easy to expand/change work area
- ▶ Navigates dynamically while planning it's own path and sequence

How It Works



Solution Overview



MiR100



MiR200



MiR250



MiR500



MiR1000



MiR Lifts



MiR Charge



MiR Fleet



MiR AI Camera

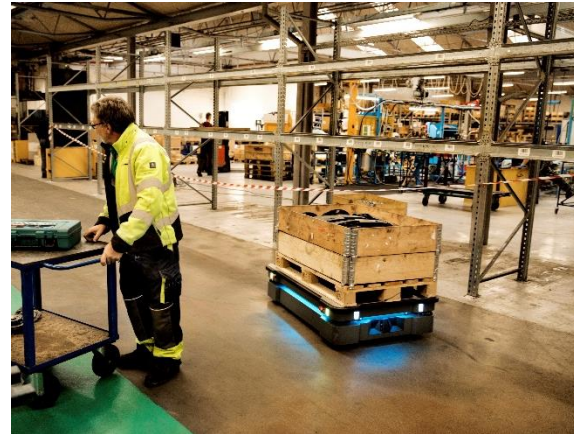


MiRHook

A Solution For All Industries

Everywhere, where internal transportations take place, MiR robots can optimize the processes

- ▶ Automotive
- ▶ Electronics
- ▶ Third-party logistics (3PLs)
- ▶ Hospitals
- ▶ Food & Beverage
- ▶ Life Science
- ▶ Consumer Goods
- ▶ ...and many more



Collaborative Operations

Safe and user-friendly collaboration with human colleagues



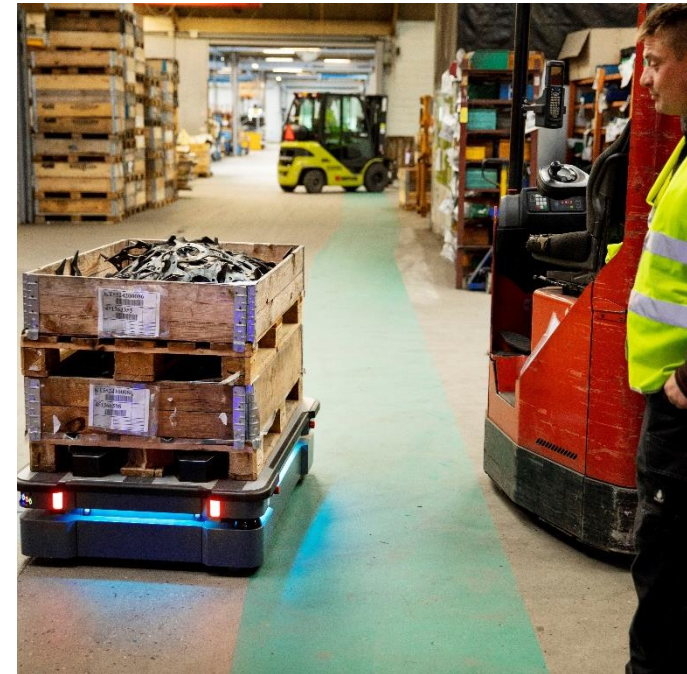
User-friendly interface MORE

- Easily programmed, with no prior experience needed
- Missions can easily be adapted via tablet, smartphone or pc
- Daily users can summon a robot with one click of a button



Works safely alongside humans MORE

- Safely and efficiently maneuvers around people and obstacles
- Safety stop if someone walks out in front of it
- Complies with relevant safety standards MORE



Improves working environment

- Redeploy human workers for more valuable work
- Reduces work-related injuries

References



Technology & Concept

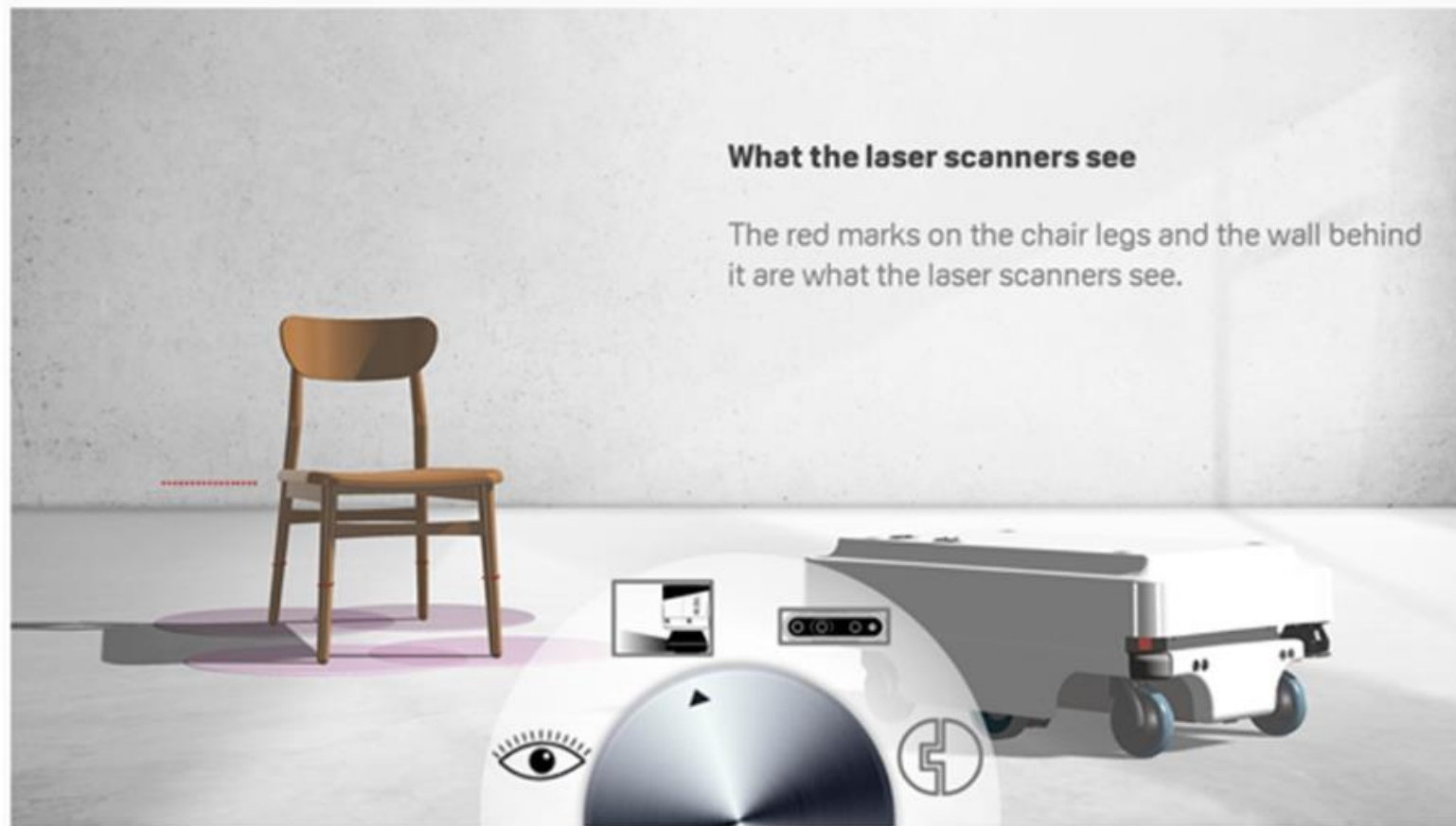
Collaborative Operations

How a MiR robot sees its environment



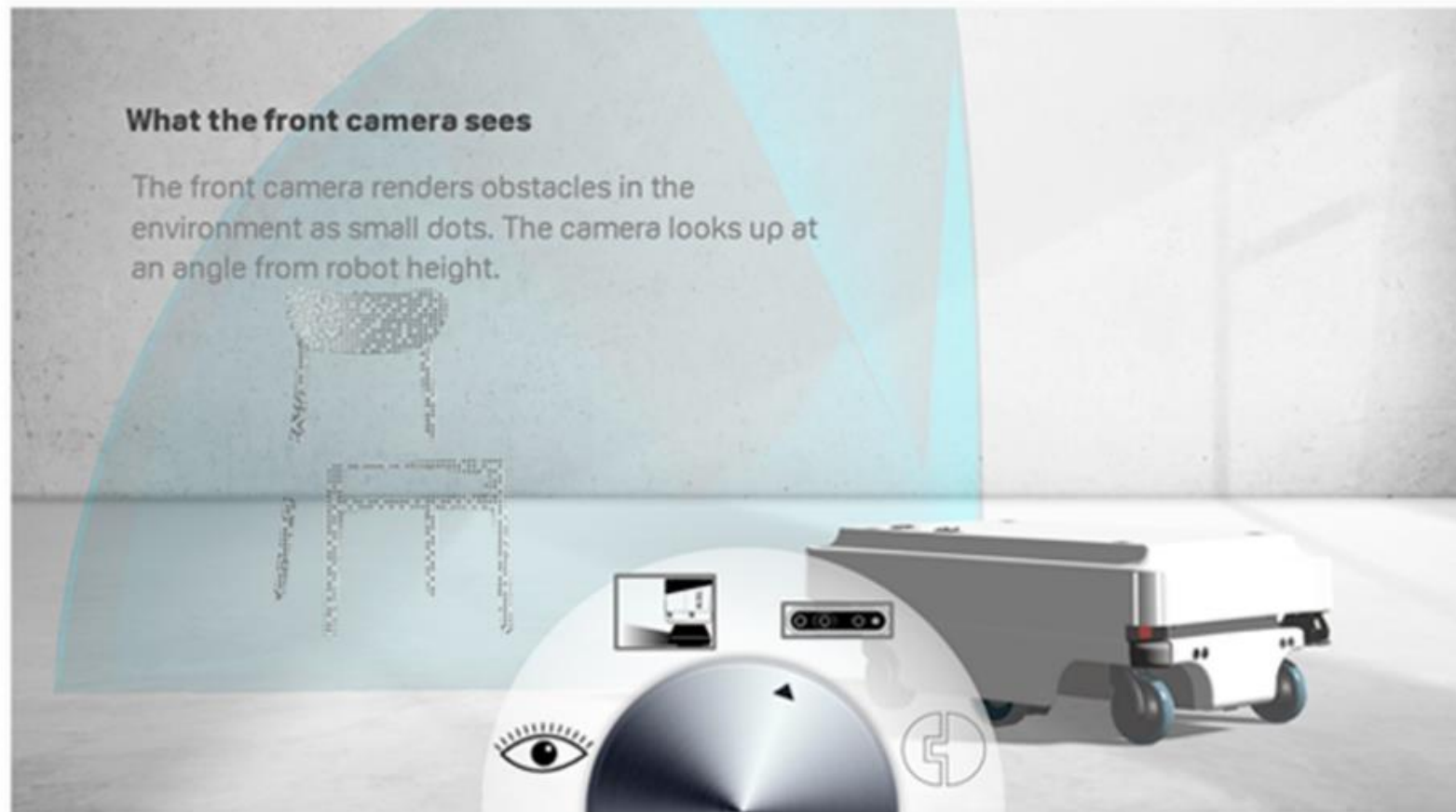
Collaborative Operations

How a MiR robot sees its environment



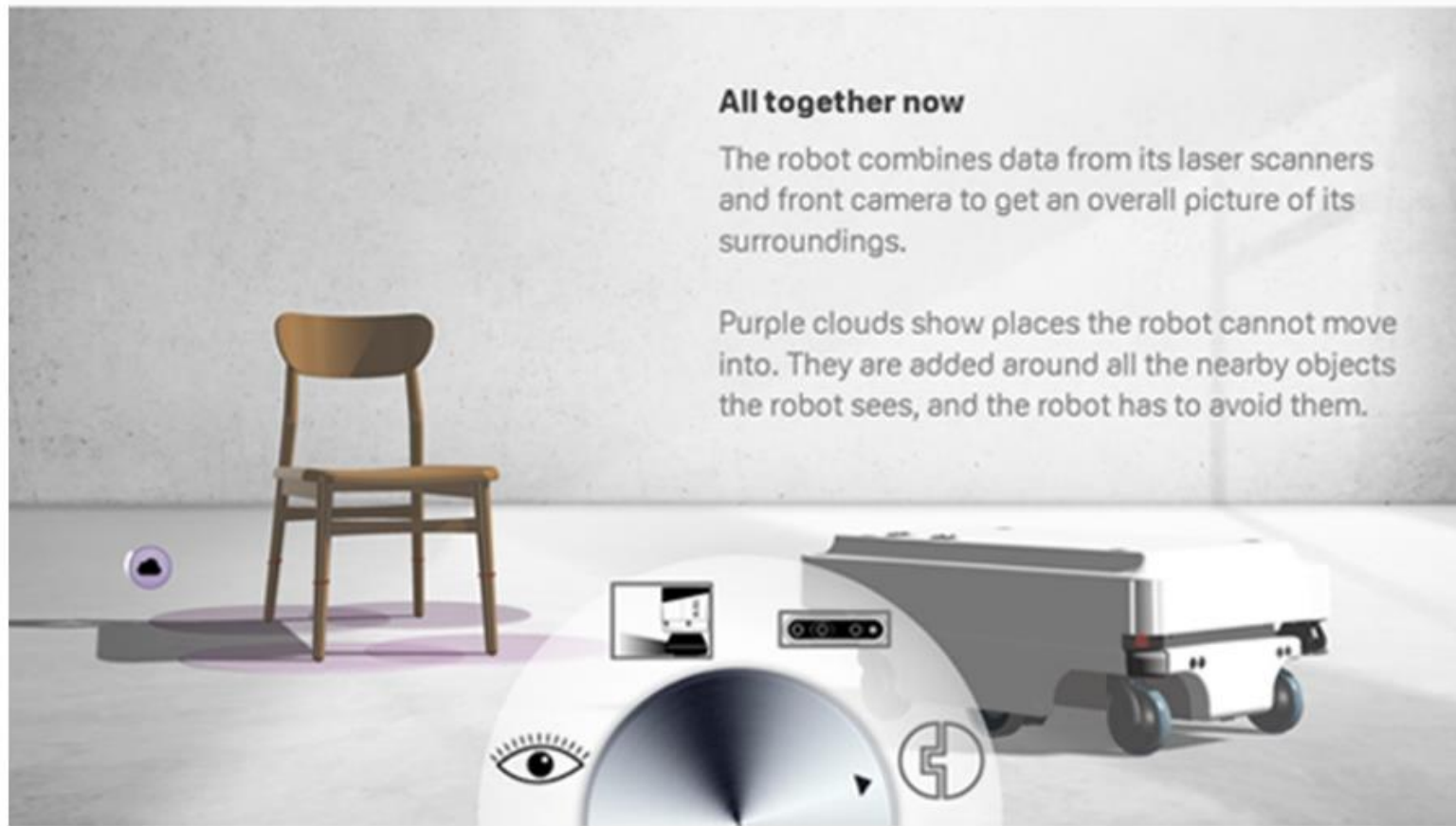
Collaborative Operations

How a MiR robot sees its environment



Collaborative Operations

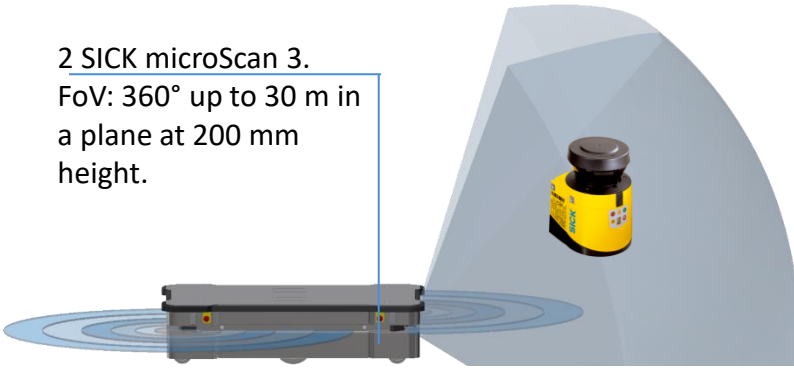
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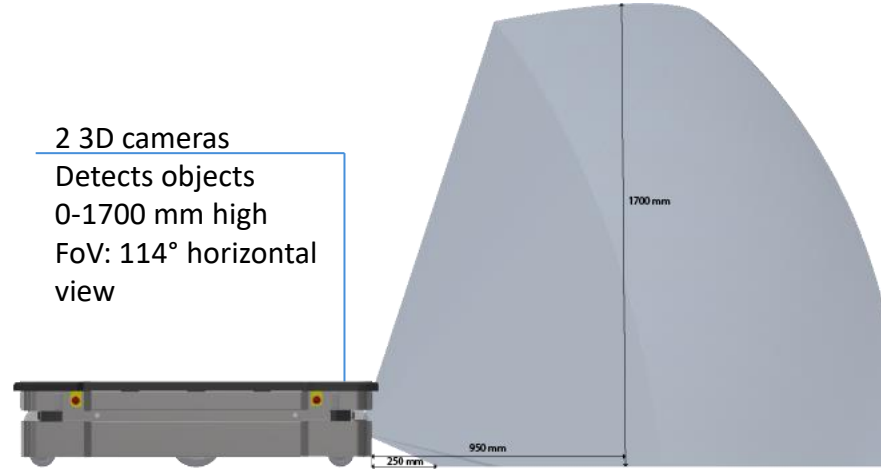
Collaborative Operations

Sensory input – MiR500 and MiR1000

2 SICK microScan 3.
FoV: 360° up to 30 m in
a plane at 200 mm
height.



2 3D cameras
Detects objects
0-1700 mm high
FoV: 114° horizontal
view

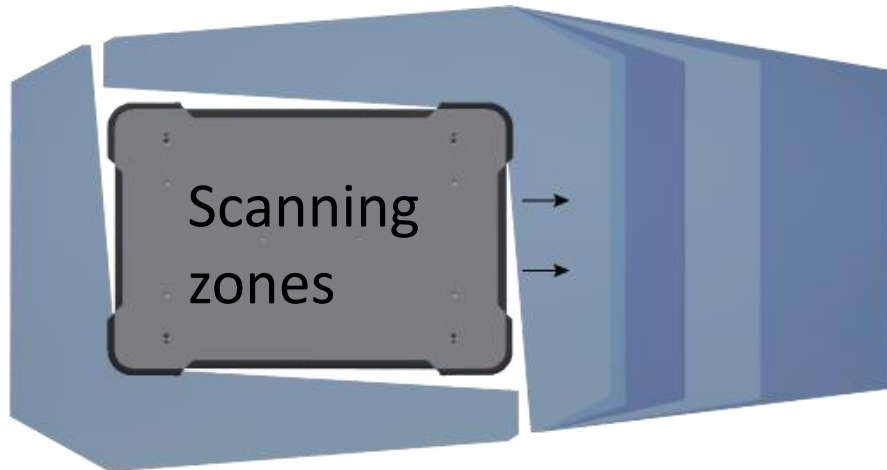


4 proximity sensors in each corner
Pallet and feet detection



Navigation

Autonomous and flexible

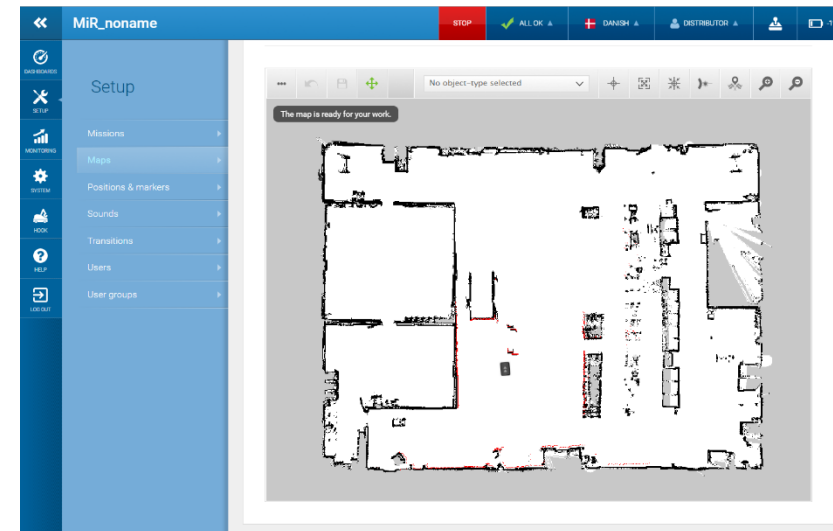


LiDAR SLAM

- ▶ Simultaneous Localization, Mapping and Motion Control
- ▶ Use of Laser Scanners to create a map
- ▶ Map and Laser Scanners used to Localize the robot

Mapping

- ▶ When the map created, the robot will match live scanner data with the map that is already stored in the robot.
- ▶ In order to have a good localization the MiR robot requires only 35% of the laser scanner data to match with the map
- ▶ The MiR Robot also uses the gyroscope and the motor drive wheel encoders



Collaborative Operations

User-friendly Intuitive Interface for easy programming

- ▶ Enables customers to take full ownership of their mobile robots
- ▶ Flexible user management and user permissions
- ▶ Customizable dashboards tailored to your needs, no limit of number of dashboards
- ▶ Comprehensive browser support (latest and second-newest browser versions of all the most common browsers)
- ▶ Simple map editing and creation of robot missions



Flexibility

An open interface supports different applications



Flexibility

An open interface supports different applications



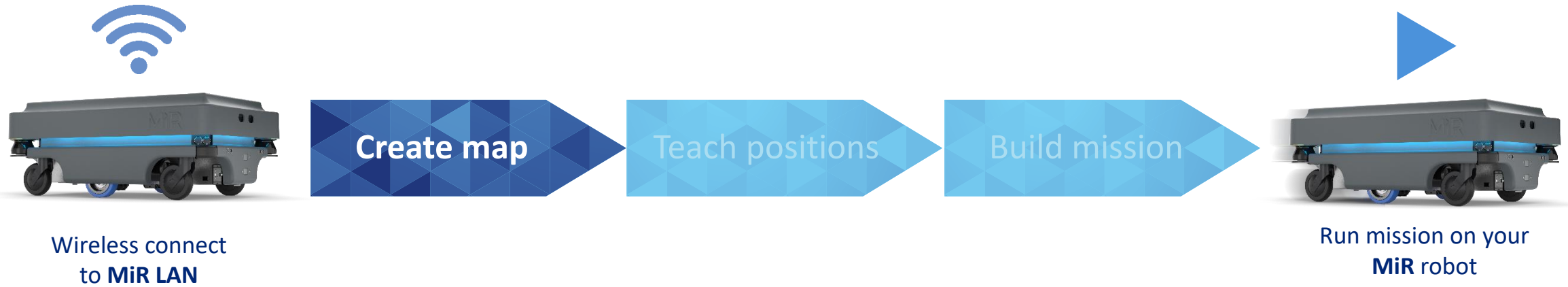
Flexibility

An open interface supports different applications

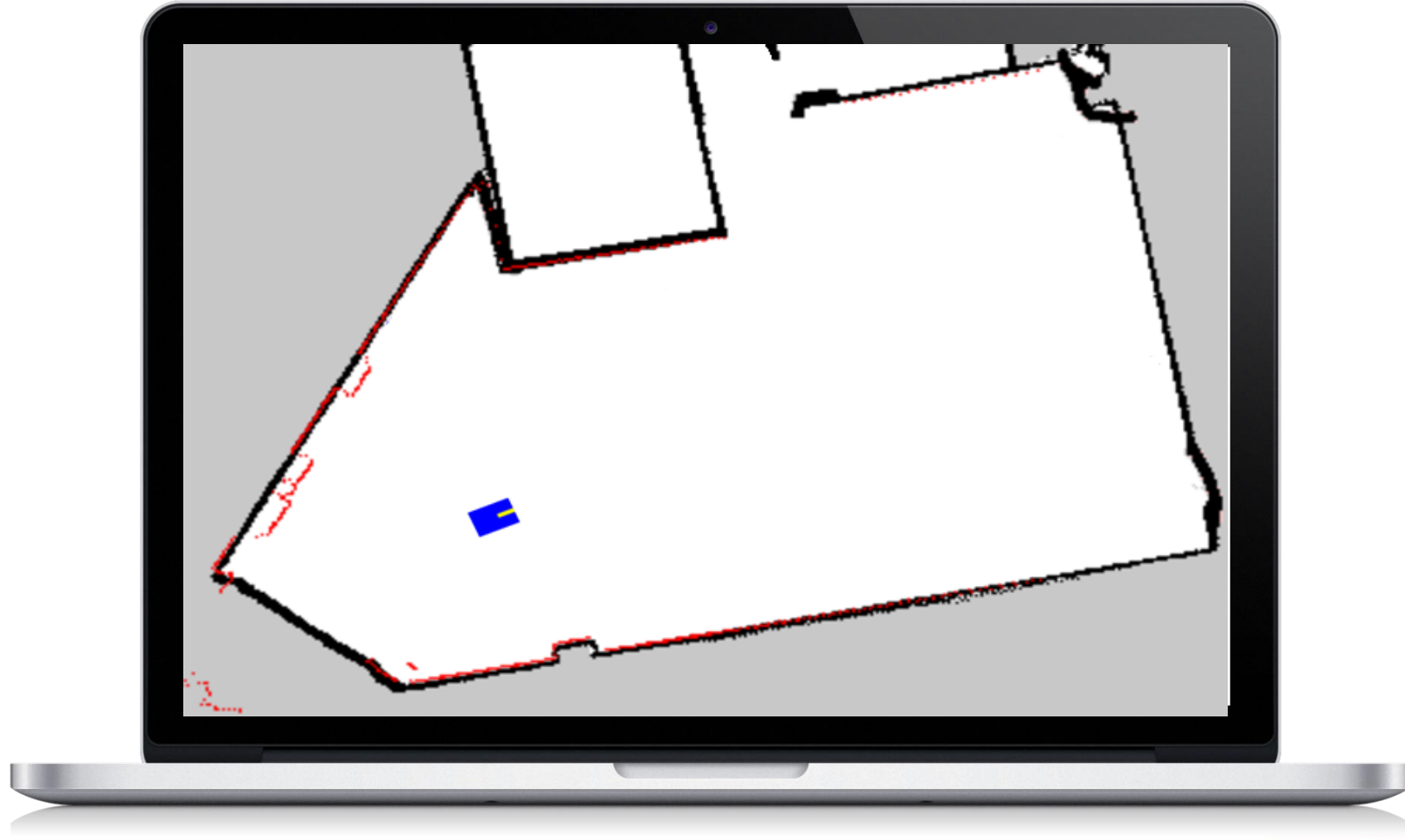


How to use the MiR robot

How To Use A MiR Robot



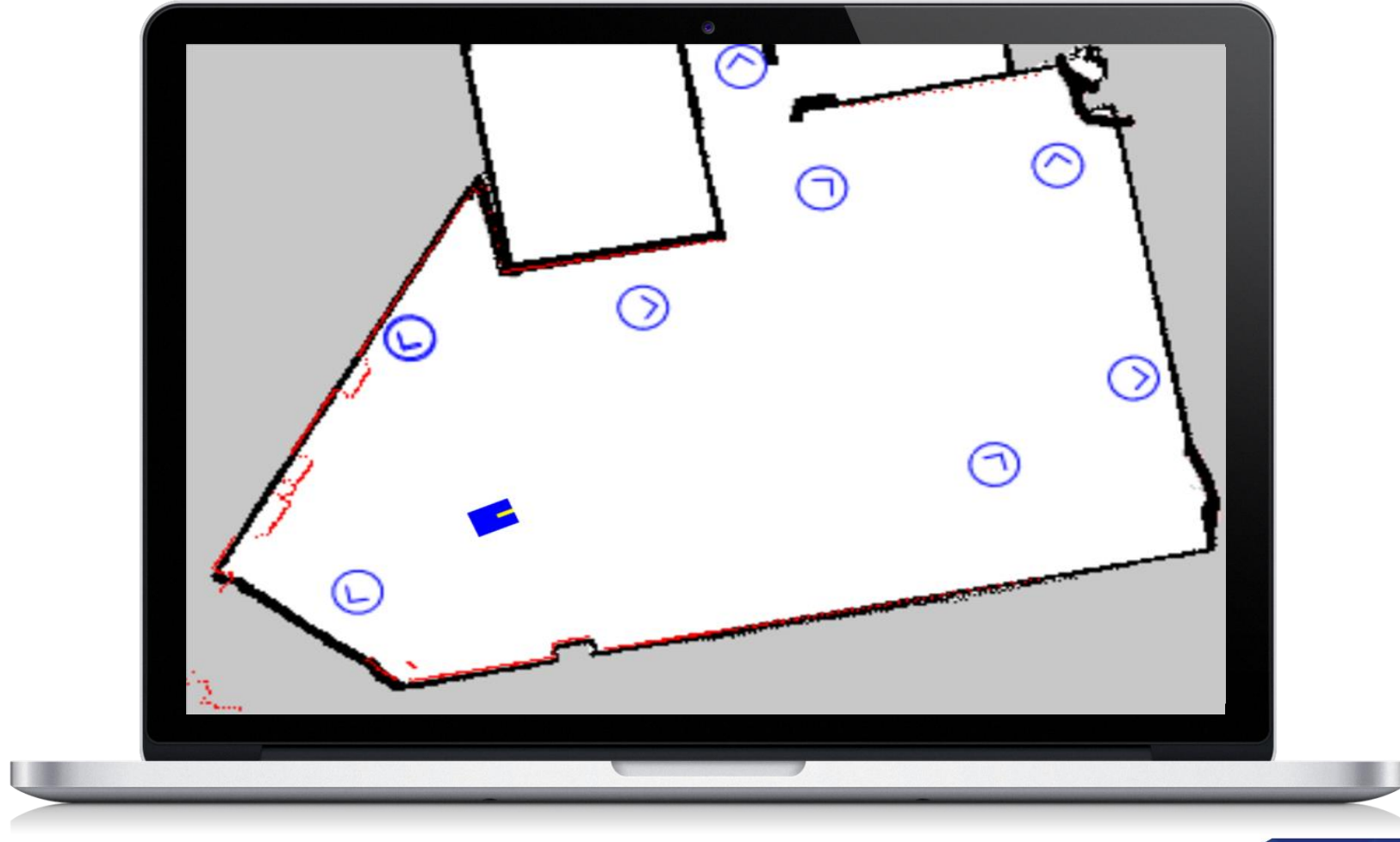
Create Map



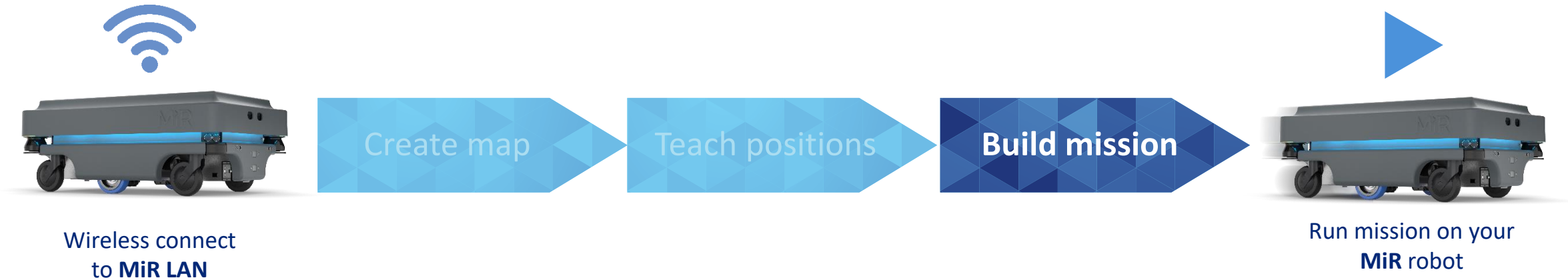
How To Use A MiR Robot



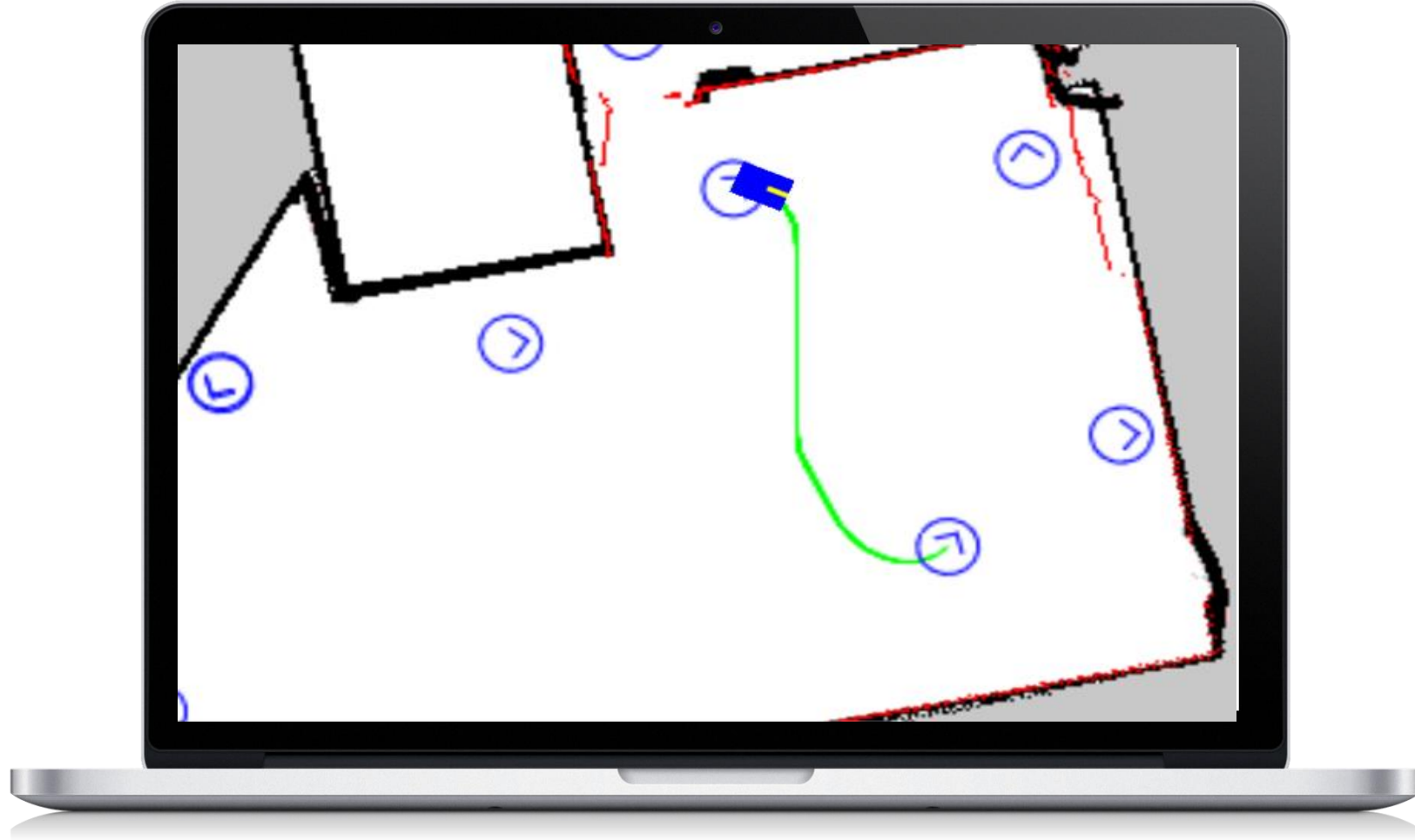
Teach Positions



How To Use A MiR Robot



Build Mission



Thank you

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MiR

Questions?

Cases

Case Stories



Case: Ford

FORD has deployed three **MiR100** robot, which delivers spare parts from storage to FORD's manufacturing lines in their Valencia plant. Tests conducted by FORD showed that one mobile robot alone frees up to 40-man hours per day.



Case: STERA

Stera has deployed a **MiR500** autonomous mobile robot to deliver components from the warehouse to the production and finished goods back to the warehouse.



Case: Honeywell

Three **MiR100** robots from Mobile Industrial Robots (MiR) are helping Honeywell Safety & Productivity Solutions keep its manufacturing processes lean and agile and optimizing workflows by automating the transfer of materials throughout the facility.

Case Stories



Case: Cabka

A **MiR500** equipped with a MiR500 Lift is a key component in a fully automated production line at pallet manufacturer, Cabka. The MiR500 is loaded with finished pallets by a six-axis robot and transport them from production to a separate staging area as soon as the job is complete, keeping the production floor clear.



Case: Visteon

Four **MiR200** robots with different top modules deliver parts for production and collect waste materials at Visteon. The robots have a ROI on less than a year due to their user-friendliness, fast implementation and the increased productivity



Case: Nidec

To keep production processes lean and stocks low, NIDEC relies on three **MiR100s** equipped with MiRHooks to transport material and empty containers between the warehouse and assembly lines. The three robots drive 11 km/day each.

Case Stories



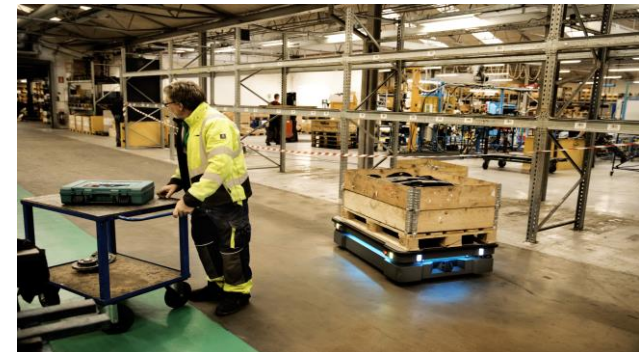
Case: Hitachi

A **MiR200** improves the productivity and safety at Johnson Controls Hitachi. The mobile robot picks up shelving units in the storeroom and carries materials to the production line where it picks up waste packaging. The robot operates during a full 8-hour shift and has eliminated electric trolleys from the factory floor, making it a safer place for all.



Case: Kamstrup

At Kamstrup three **MiR100** robots equipped with conveyors are important factors. They have challenged the traditional conveyor belts in the production hall in which semi-finished and finished items are to be transported between production lines and robotic cells.



Case: Kverneland

Kverneland is using a **MiR500** to reduce the amount of indoor truck driving in order to improve the working environment and productivity.

Products

MiR100

Technical Specifications

| | |
|------------------------------------|---|
| Payload: | 100 kg – 220 lbs. |
| Towing capacity (with MiRHook100): | 300 kg – 660 lbs. |
| Precision: | +/-50 mm - +/- 2" of position +/- 10 mm - +/- 0.4" to docking marker |
| Max speed forwards: | 1.5 m/s – 4.9 ft/s |
| Max speed backwards: | 0.3 m/s – 1.0 ft/s |
| Battery run time: | 10 hours or 20 km – 12.5 mi |
| Weight: | 65 kg – 143 lbs. |
| Battery charging: | 0-80%: 2 hours |
| Communication: | Wi-Fi, Bluetooth, Ethernet and PLC |
| Safety: | Complies with EN1525 safety regulations, SICK safety lasers, PL=d cat. 3 |
| CE certified: | Yes |



MiR200

Technical Specifications

| | |
|------------------------------------|---|
| Payload: | 200 kg – 440 lbs. |
| Towing capacity (with MiRHook200): | 500 kg – 1100 lbs. |
| Precision: | +/-50 mm - +/- 2" of position +/- 10 mm - +/- 0.4" to docking marker |
| Max speed forwards: | 1.1 m/s – 3.6 ft/s |
| Max speed backwards: | 0.3 m/s – 1.0 ft/s |
| Battery run time: | 10 hours or 20 km – 12.5 mi |
| Weight: | 65 kg – 143 lbs. |
| Battery charging: | 0-80%: 2 hours |
| Communication: | Wi-Fi, Bluetooth, Ethernet and PLC |
| Safety: | Complies with EN1525 safety regulations, SICK safety lasers, PL=d cat. 3 |
| CE certified: | Yes |
| ESD approved: | Yes |
| Clean Room certified: | Yes |



MiR250

Technical Specifications

| | |
|---|--|
| Payload: | 250 kg – 551 lbs. |
| Towing capacity (with MiR Shelf Carrier): | 300 kg – 661 lbs. |
| Precision: | +/-50 mm - +/- 2" of position +/- 10 mm - +/- 0.4" to docking marker |
| Maximum speed: | 2.0 m/s – 6.6 ft/s |
| Battery run time: | 13 hours |
| Weight: | 83 kg – 183 lbs. |
| Battery charging: | 0-80%: 1 hours |
| Communication: | Wi-Fi, Bluetooth, Ethernet and PLC |
| Sensors: | SICK Nanoscan3 safety system for 360° visual protection, 3D cameras detect objects 1700 mm high at a distance of 950 mm in front of the robot. 114° total horizontal view. Ground view, minimum distance from robot: 250 mm. |
| Safety: | Compliant with ISO/CD 3691-4, EN1525, ANSI B56.5, EMC EN61000-6-2, & EN61000-6-3. |
| CE certified: | Yes |
| ESD Optional: | Yes |



MiR500

Technical Specifications

| | |
|---------------------|---|
| Payload: | 500 kg – 1100 lbs. |
| Precision: | +/-50 mm - +/- 2” of position +/- 10 mm - +/- 0.4” to docking marker |
| Max speed forwards: | 2.0 m/s – 6.5 ft/s |
| Battery run time: | 8 hours |
| Weight: | 226 kg – 498 lbs. |
| Battery charging: | 10-90%: 1 hour |
| Communication: | Wi-Fi, Bluetooth, Ethernet and PLC |
| Sensors: | SICK Microscan3 safety system for 360° visual protection, 3D cameras detect objects 1700 mm high at a distance of 950 mm in front of the robot. 114° total horizontal view. Ground view, minimum distance from robot: 250 mm. |
| Safety: | Compliant with ISO/CD 3691-4, EN1525, ANSI B56.5, EMC EN61000-6-2, & EN61000-6-3. |
| CE certified: | Yes |



MiR1000

Technical Specifications

| | |
|---------------------|---|
| Payload: | 1000 kg – 2200 lbs. |
| Precision: | +/-50 mm - +/- 2” of position +/- 10 mm - +/- 0.4” to docking marker |
| Max speed forwards: | 1.2 m/s – 3.9 ft/s |
| Battery run time: | 8 hours |
| Weight: | 231 kg – 508 lbs. |
| Battery charging: | 10-90%: 1 hour |
| Communication: | Wi-Fi, Bluetooth, Ethernet and PLC |
| Sensors: | SICK Microscan3 safety system for 360° visual protection, 3D cameras detect objects 1700 mm high at a distance of 950 mm in front of the robot. 114° total horizontal view. Ground view, minimum distance from robot: 250 mm. |
| Safety: | Compliant with ISO/CD 3691-4, EN1525, ANSI B56.5, EMC EN61000-6-2, & EN61000-6-3. |
| CE certified: | Yes |



MiR Hook 100 & MiR Hook 200

Technical Specifications

Collaborative mobile robots with hook for fully-automated pick-up and delivery of carts

| | |
|-------------------------------|--|
| Length: | 1180-1275 mm (highest to lowest positions of hook arm) |
| Width: | 580 mm |
| Height: | 550 to 900 mm (lowest to highest positions of hook arm) |
| Height above floor: | Robot: 50 mm, Gripping height: 80 mm - 350 mm |
| Weight (without load): | 98 kg - 216 lbs. |
| MiR Hook 100 towing capacity: | Up to 300 kg at <1% incline - 200 kg at 5% incline |
| MiR Hook 200 towing capacity: | Up to 500 kg at <1% incline - 300 kg at 5% incline |
| Battery time: | 8-10 hours (depending on load) |
| Max speed forwards: | MiR Hook 200: 1.1 m/s – 3.6 ft/s MiR Hook 100: 1.5 m/s – 4.9 ft/s |
| Communication: | Wi-Fi, Bluetooth, Ethernet and PLC |
| Safety: | Complies with EN1525 safety regulations SICK safety lasers, PL=d cat. 3 |



MiR Shelf Carrier

Technical Specifications

Designed for autonomous pickup/drop off of shelf, carts and other applications

Payload MiR Shelf Carrier: 250 kg – 550 lbs.



MiR Pallet Lift & MiR EU Pallet Lift

Technical Specifications

Designed for autonomous pickup/dropoff of pallets

Pallet lift height and speed: 60 mm in less than 7 sec.

Payload MiR500 EU Pallet Lift: 500 kg – 1100 lbs.

Payload MiR500 Lift: 500 kg – 1100 lbs.

Payload MiR1000 EU Pallet Lift: 1000 kg – 2200 lbs.

Payload MiR1000 Lift: 1000 kg – 2200 lbs.

Surface of pallet lifts: Non-slip

Dimension of pallets – MiR EU pallet lift: 1200 x 800 mm

Dimensions of pallets – MiRLift: Universal size

EU Pallet Lift 500/1000 dimensions: 1200 x 162 x 95 mm

Pallet Lift 500/1000 dimensions: 1430 x 1142 x 357 mm



MiR Pallet Rack & MiR EU Pallet Rack

Technical Specifications

Pickup and unloading station for the MiR500 and MiR1000 when using lifts

| | |
|-----------------------------------|-----------------------------|
| Pallet size MiR EU Pallet Rack: | 1200 x 800 mm |
| Pallet size MiR Lift Pallet Rack: | Standard supports 40" x 48" |
| Payload: | 1000 kg – 2200 lbs. |
| Dimensions MiRLift Pallet Rack: | 1300 x 1182 x 442 mm |
| Dimensions MiR EU Pallet Rack: | 1300 x 1182 x 452 mm |



MiR Charge 24V & MiR Charge 48V

Technical Specifications

MiRCharge 24V for autonomous charging of MiR100 and MiR200

MiRCharge 48V for autonomous charging of MiR250 and MiR500 and MiR1000

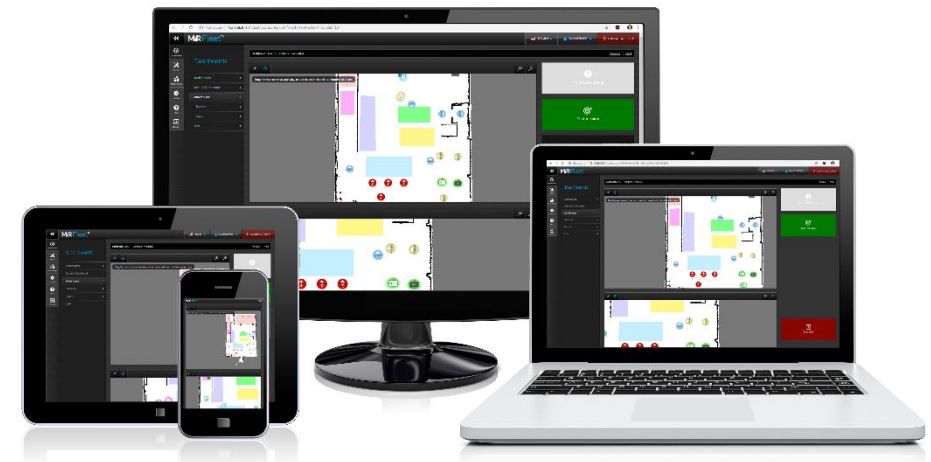
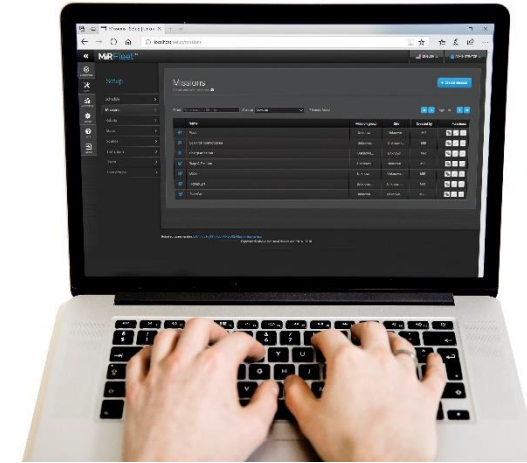
Includes a VL Marker for accurate docking

| | |
|----------------------------|---|
| Weight MiRCharge 24V: | Output: 24 V, max 25 A Input: 100 - 230 V ac, 50-60 Hz |
| Weight MiRCharge 48V: | Output: 48 V, 40 A at 230V, 20 A at 110 V Input: 100 V - 230 V, 50-60 Hz |
| Dimensions MiRCharge 24V : | 580 x 300 x 120 mm |
| Dimensions MiRCharge 48V : | 620 x 340 x 200 mm |
| Weight MiRCharge 24V: | 10.5 kg / 22 lbs. |
| Weight MiRCharge 48V: | 21 kg / 46 lbs. |



MiR Fleet

- ▶ Fleet Management for optimized robot traffic
- ▶ Handles up to 100 robots
- ▶ Automatic prioritization and selection of the robot best suited for a job, based on position and availability
- ▶ Planning of the use of different top modules
- ▶ Comes as a physical PC box or a server solution



MiR AI Camera

Optimizes the overall interaction with other moving elements and the efficiency of the robot

- ▶ Enables the MiR robots to recognize different obstacles and react accordingly
- ▶ Enables the robots to foresee blocked or highly trafficked area and reroute in time

