Step Change Results from the Project

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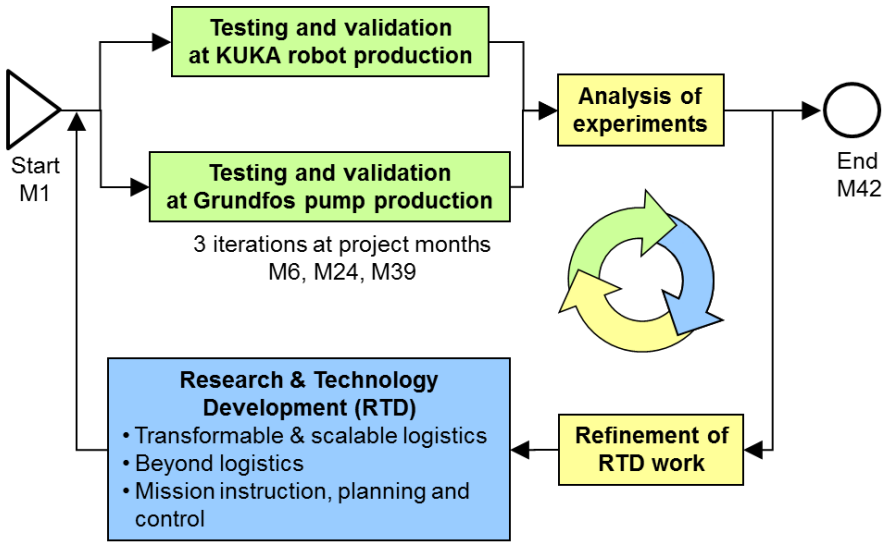
The TAPAS Project (10/2010 – 06/2014)

"Robotics-enabled logistics and assistive services for the transformable factory of the future"

Project objectives:

- flexible and fast part logistics, extended logistics services
- assistive (preparatory and post-processing) tasks
- R&D in ICT for more robust and complete services
- tests and validation in an iterative fashion

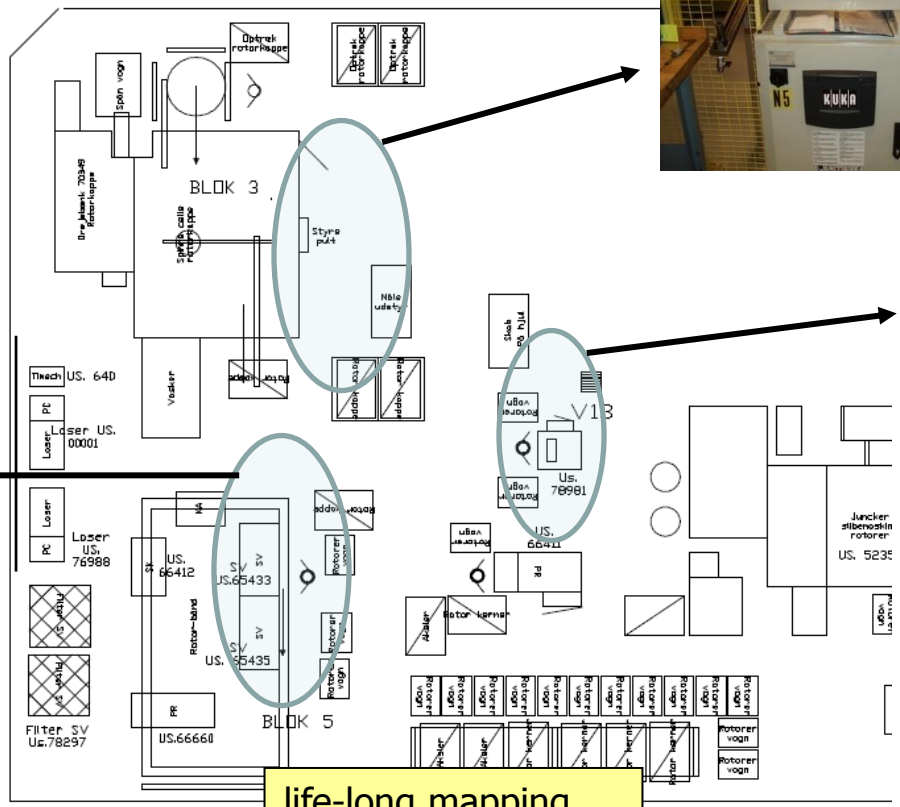


This project is funded by the European Union

Mobile manipulation use cases in industrial environments

Serving quality control stations: inserting and retrieving parts

Feeding, emptying, operating machine tools, part inspection



life-long mapping and local navigation

Serving manual work stations: tray delivery and collection, pre-assembly, quality control

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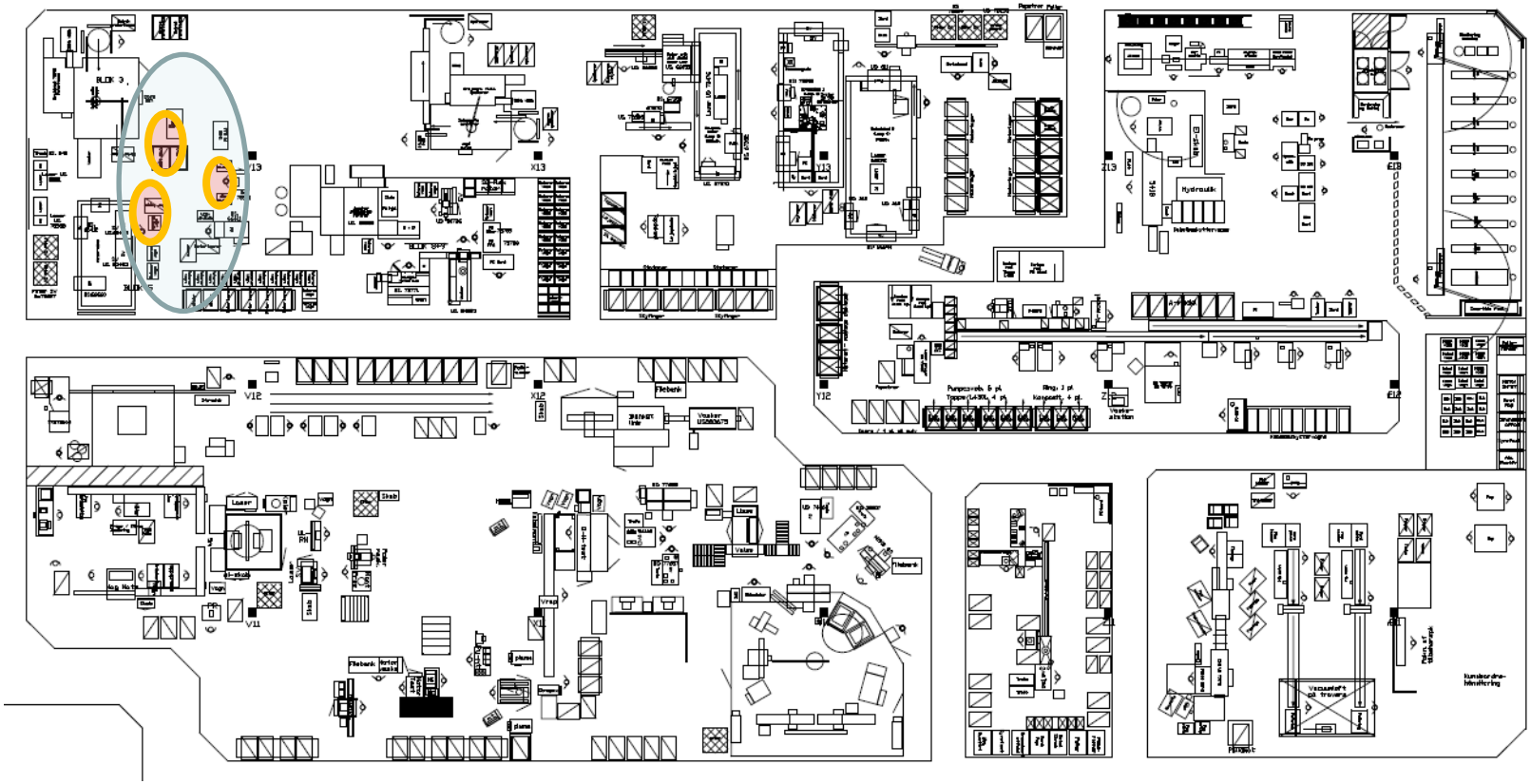
Even more use cases and tasks (SQ factory)



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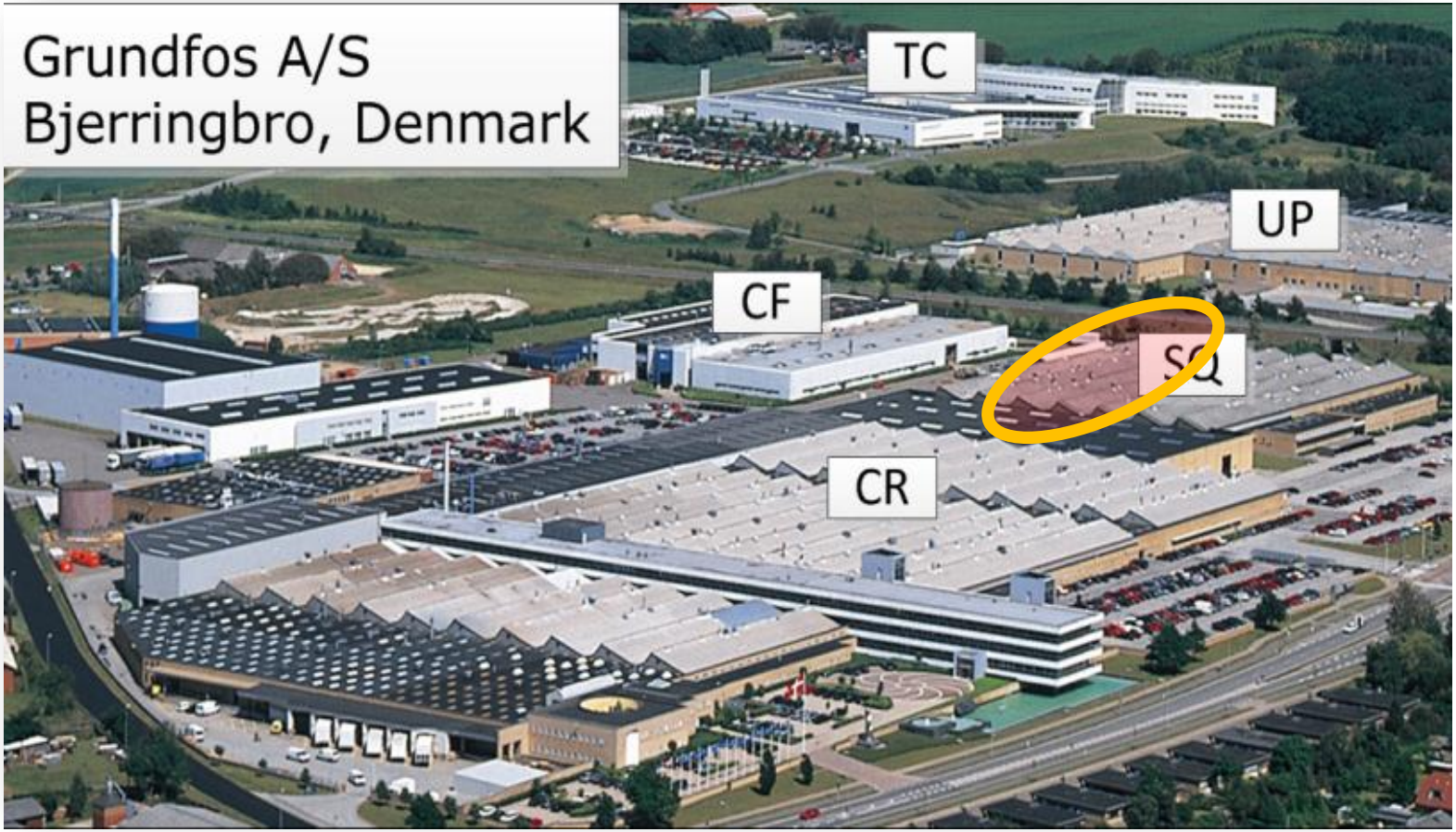
Even more use cases and tasks (Bjerringbro)



Altogether: 566 “simple” tasks

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Evaluation at Grundfos

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Main achievements

- Relevant industrial tasks **can be solved** today:
  - Multiple part feeding
  - Transportation
  - Machine tending
- Based on
  - **precise and robust navigation** (few millimeter accuracy)
  - **application specific robust manipulation skills**
  - **robust motion planning for arm and platform**
  - **programming methodologies** enabling the programming and setup by a shop floor operator with little to **no prior robotics experience** and **relatively little programming time**.

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Challenges

- Adapting the robots to new tasks involves a number of **time consuming hardware setup tasks** (e.g. setup of feeders, grippers and access to machines).
- **Integration** into the surrounding manufacturing system is possible, but is currently a **time consuming task**.
- **Robustness and processing speed** must be increased
- **Safety systems for mobile manipulators** have to be developed and certified
- **Price (investment) on equipment and integration** has to come down!

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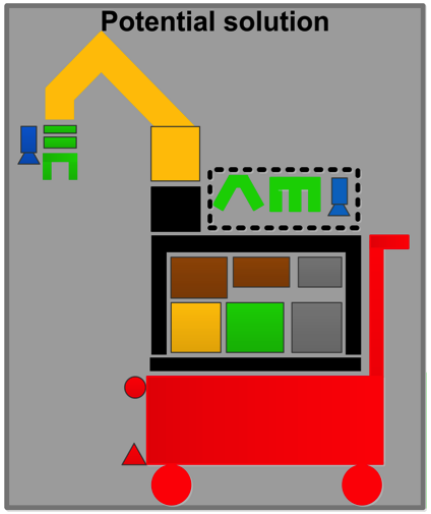
What will we see soon?

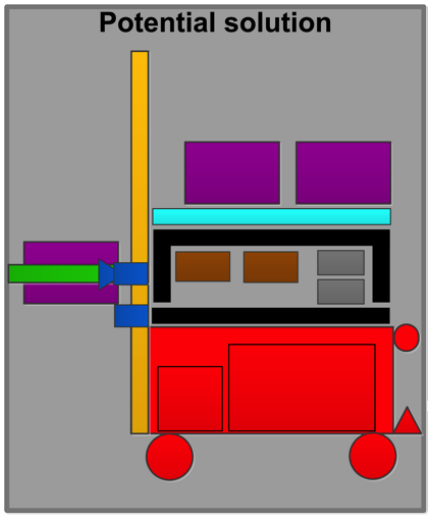
Autonomous mobility/
Advanced manipulation

KUKA omniRob



Manual mobility/
Advanced manipulation

Little Helper



Autonomous mobility/
Simple manipulation
(Little Fetcher?)

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Available soon!

KUKA flexFellow

Manual mobility/
Advanced manipulation

Autonomous mobility/
Advanced manipulation

KUKA omniRob

Little Helper

KUKA mobile iiwa

Autonomous mobility/
Advanced manipulation

Simple manipulation
(Little Fetcher?)

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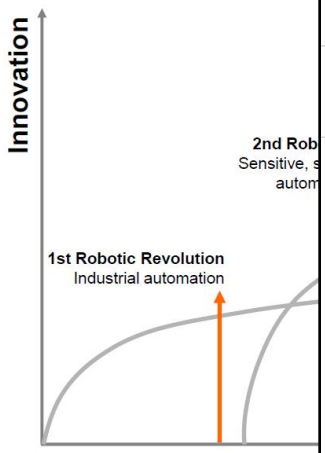
KUKA Strategy → Change of mindset!

KUKA

Development of robots

New technologies



KUKA Aktiengesellschaft

swisslog
inspired solutions

KUKA

1 Creating a global automation powerhouse

Swisslog complements KUKA perfectly

KUKA

KUKA Robotics	KUKA Systems		Swisslog
	Industries[1]	Systems	

Component — Cell — Solution

Industrial Robotics	Service Robotics Medical Robotics	Technical Solutions	Reis	Automotive	Aerospace	Warehouse Logistics	Healthcare

Integrated software solutions and modular product platform

Robotics expertise	Application and industry expertise	Systems and process expertise	Systems and process expertise

Global market access

[1] *In planning stage*

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KUKA

d general industry

Tools and dies

KTPO

Others

chnology olutions

Logistics Mobility

Revenue potential

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Thank You!

KUKA

GRUNDFOS

CONVERGENT INFORMATION TECHNOLOGIES

AALBORG UNIVERSITY

DLR

UNI FREIBURG

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