5G and beyond for industrial applications: The European research project TARGET-X

Janina Gauß, Fraunhofer IPT, 19-05-2025

Co-funded by the European Union

6GSNS

Trial PlAtform foR 5G EvoluTion Cross Industry on Large Scale

Accelerating the digital transformation of key verticals

- energy,
- construction,
- automotive, and
- manufacturing

using large-scale trials in multiple testbeds, evaluating 5G/6G technologies such as

- real-time communication,
- localization,
- self-description,
- digital twinning, and
- sensor-network data fusion

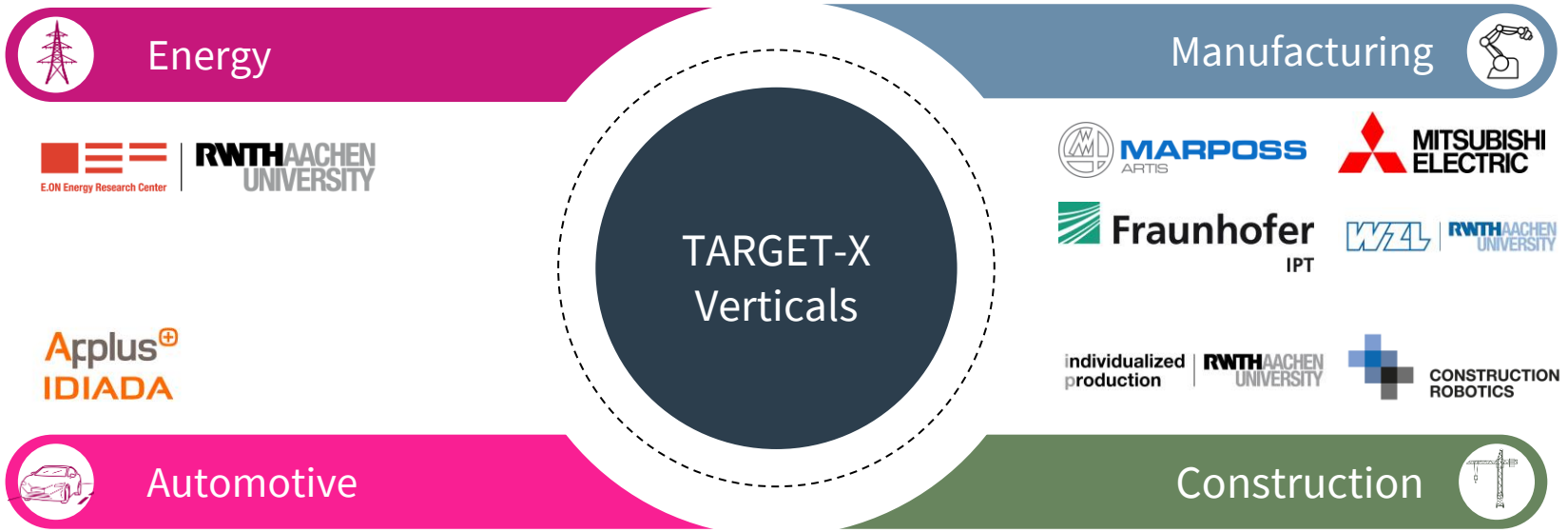
methodologically with KPIs and KVIs.

Call »SNS Large Scale Trials and Pilots (LST&Ps) with Verticals« (6GSNS Stream D)

Grant agreement ID: 101096614
Project runtime: 1.1.2023 – 31.10.2025
Project costs: €14,509,491.25
Requested EU contribution: €13,162,555.38
FSTP funding: €6,000,000.00

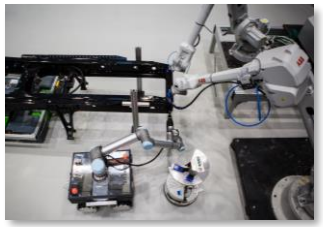
TARGET-X | Partner overview

Coordinator: Fraunhofer IPT
Technology: Ericsson Germany, Ericsson Turkey, Neutroon, Fivecomm, Qualcomm
Research: Fraunhofer IPT, RWTH-ACS, RWTH-WZL, RWTH-IP, I2CAT
Financial Support for Third Parties: FundingBox Accelerator, FundingBox Communities



TARGET-X | Testbeds

5G for energy monitoring



5G for mobile robotics

5G for cloud native production

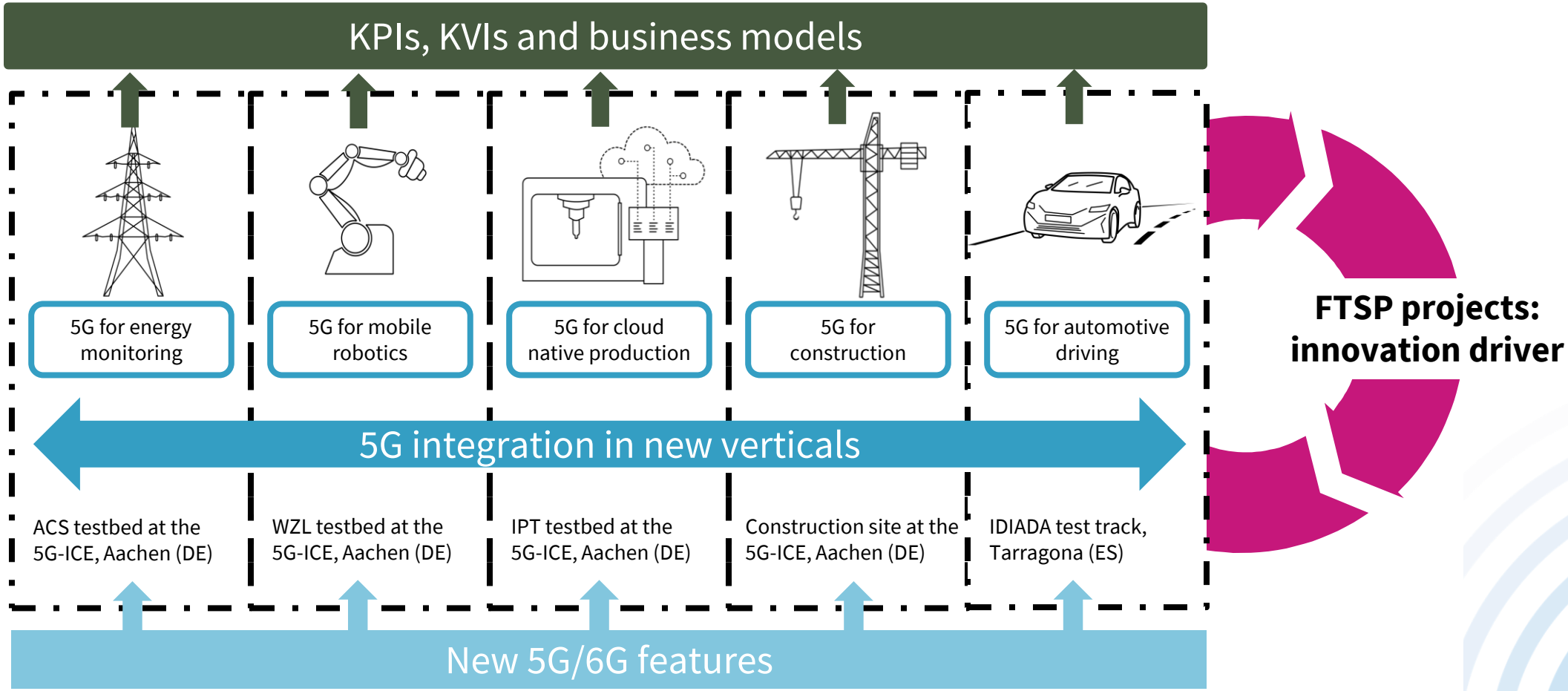
5G for construction

5G-Industry Campus Europe (5G-ICE) in Aachen, Germany

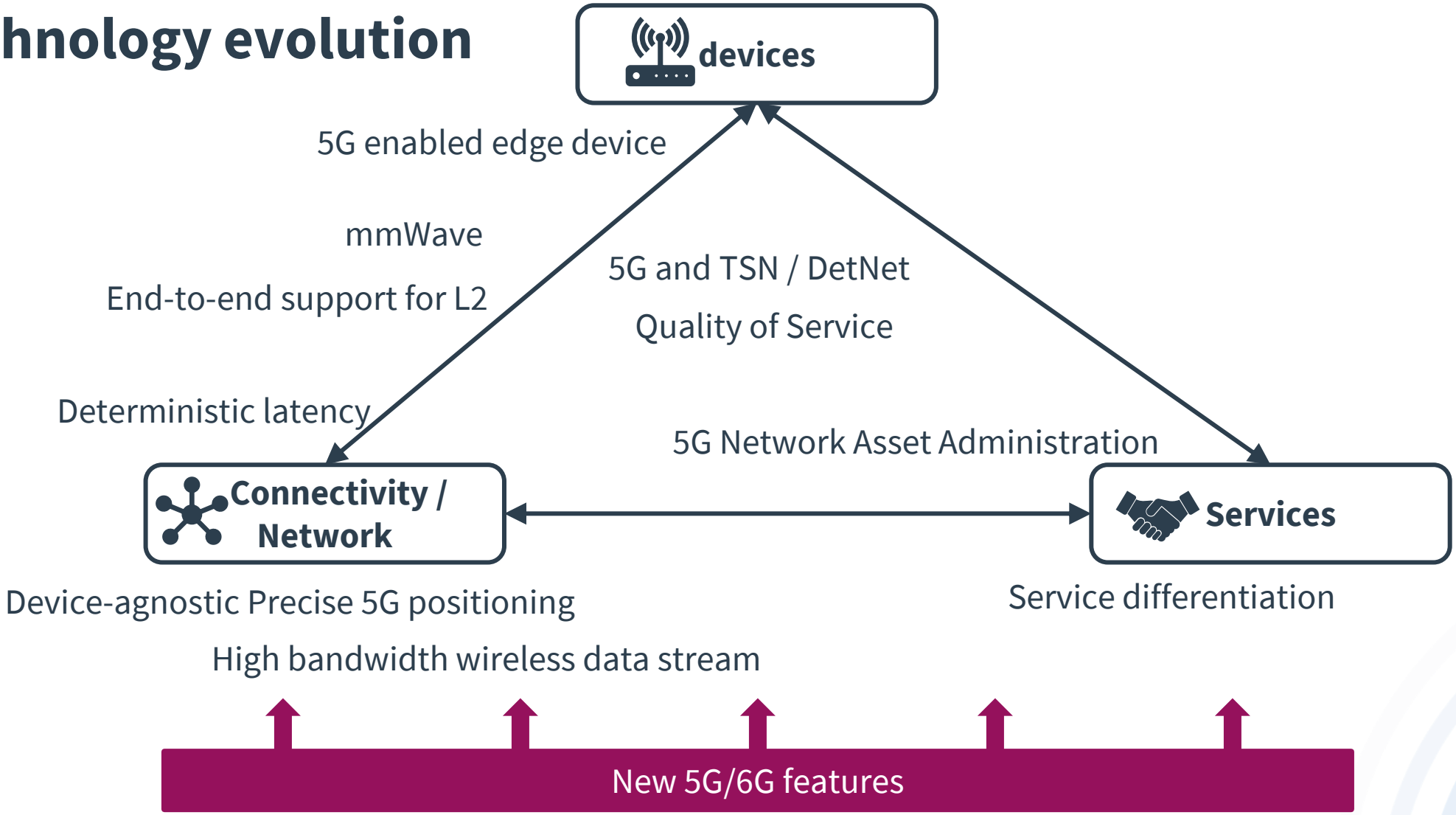
5G for autonomous driving

IDIADA testbed in Tarragona, Spain

TARGET-X | Overall concept



Technology evolution



Asset Administration Shell (AAS)

What is it?

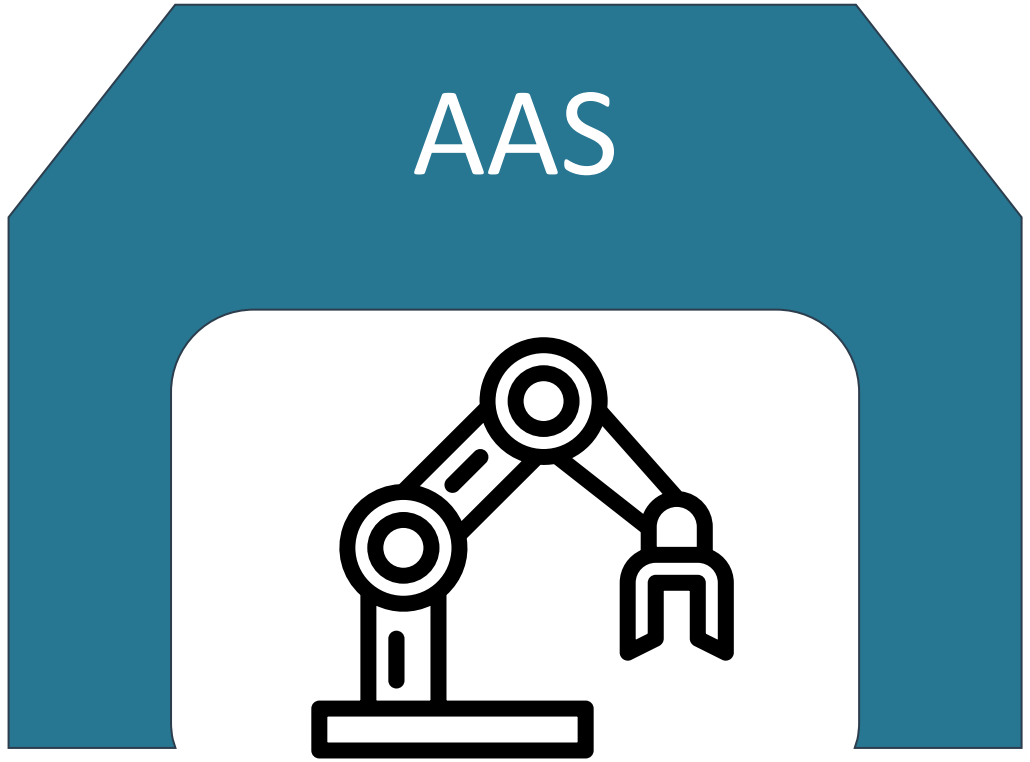
The AAS is the virtual representation of an asset.

Assets can be:

- Machines
- Materials
- Documents
- Contracts / Orders

➢ Everything of value to the company

AAS + asset = industry 4.0 component

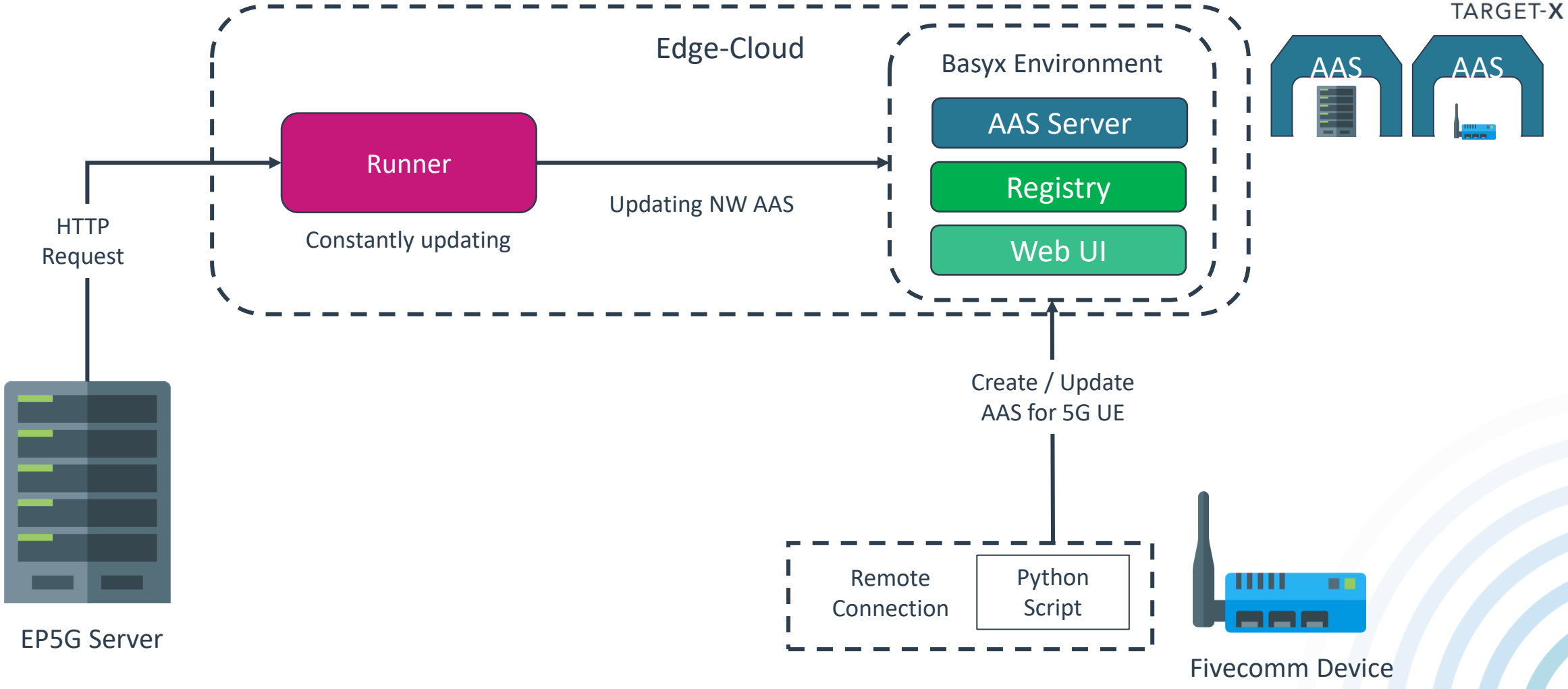


Network & User Equipment Asset Administration Shell

5G Network

5G UE

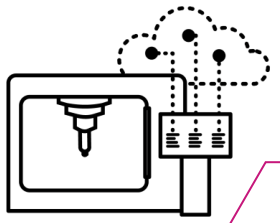
Architecture for updating the network & UE AAS



Use cases in TARGET-X

From 1st OC

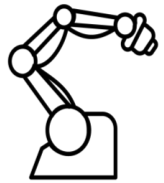
From 2nd OC



Inline Quality Assurance

Environ-mental Condition Monitoring

Trace & Tracking of work-pieces



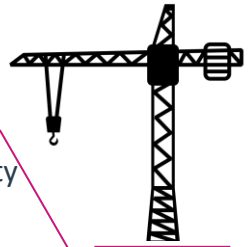
Edge Controlled Automation

Cooperative Perception

Digital Twin

Predictive QoS for Tele-operated vehicles

Energy Monitoring & Consumption Awareness



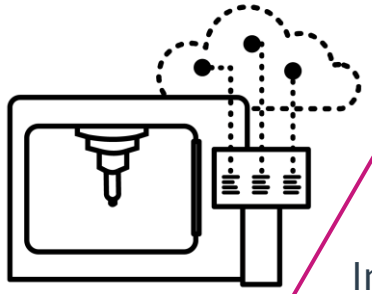
Mixed reality supported de-construction planning

Automation of de-construction processes

Energy Analytics

Safety Assistant System

Insights into the manufacturing use cases



Inline Quality Assurance

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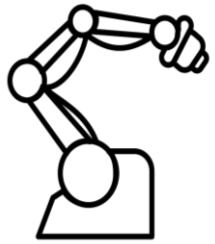
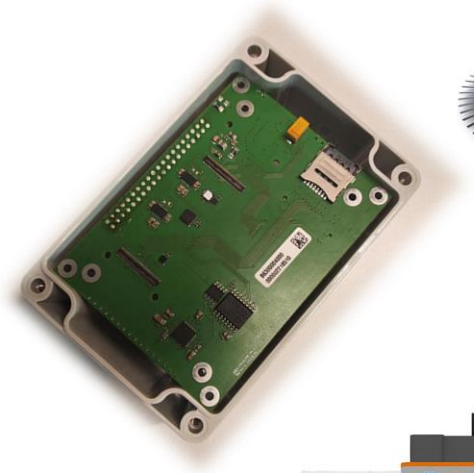
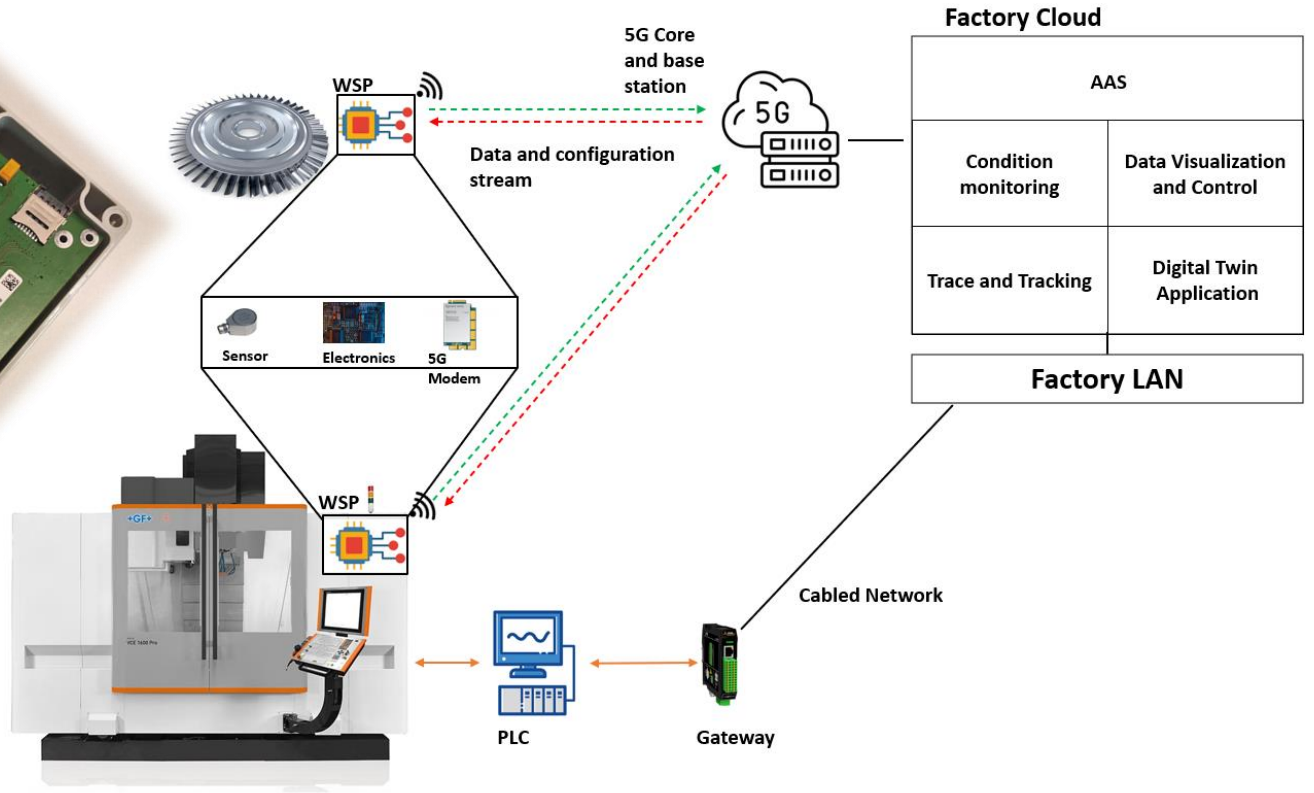


Edge Controlled Automation

Trace & Tracking of work-pieces

Environmental Condition Monitoring





- Send environmental data (e.g. energy consumption) and condition monitoring data (vibration, temperature, humidity, …)
- Easy reconfiguration via Asset Administration Shell

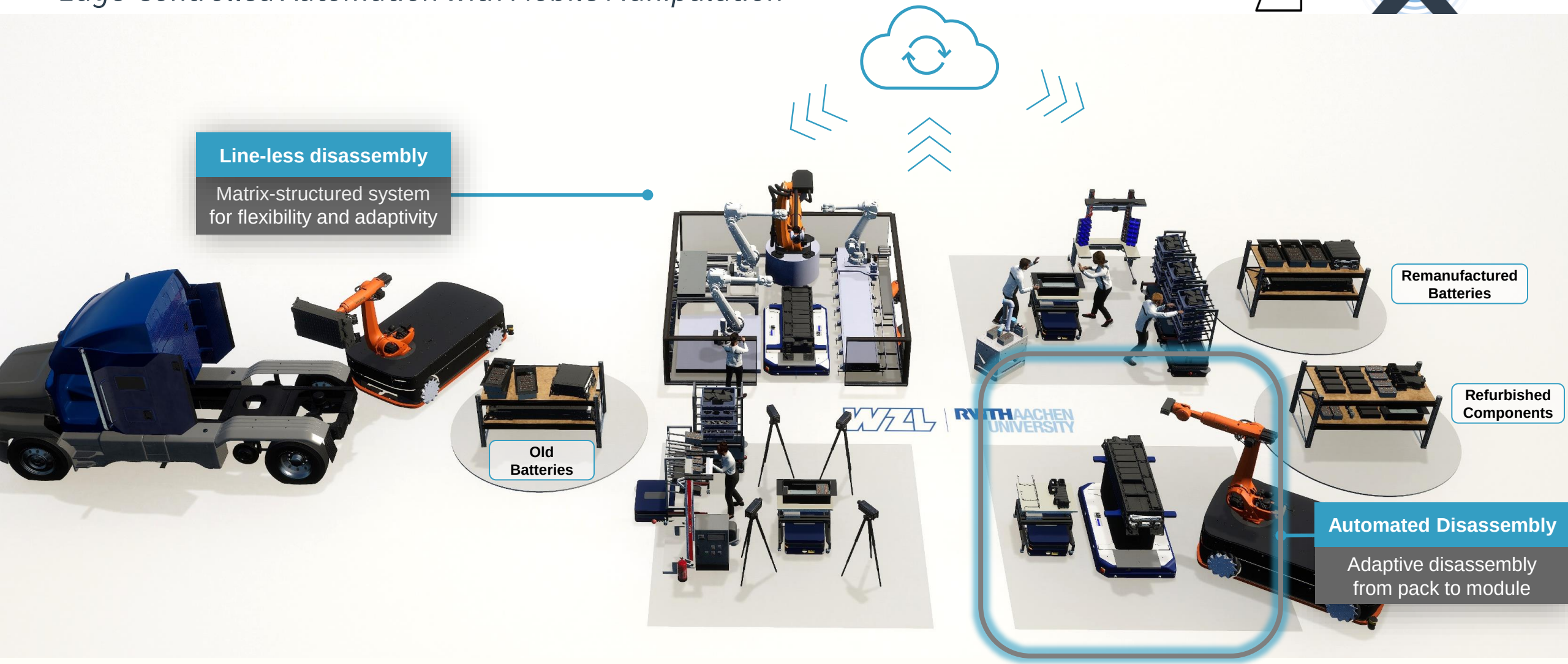
Foundation for the calculation of the environmental footprint of a manufacturing process

Use Case | Edge Robotics for EV-Battery Remanufacturing

Edge-Controlled Automation with Mobile Manipulation

Line-less disassembly

Matrix-structured system for flexibility and adaptivity



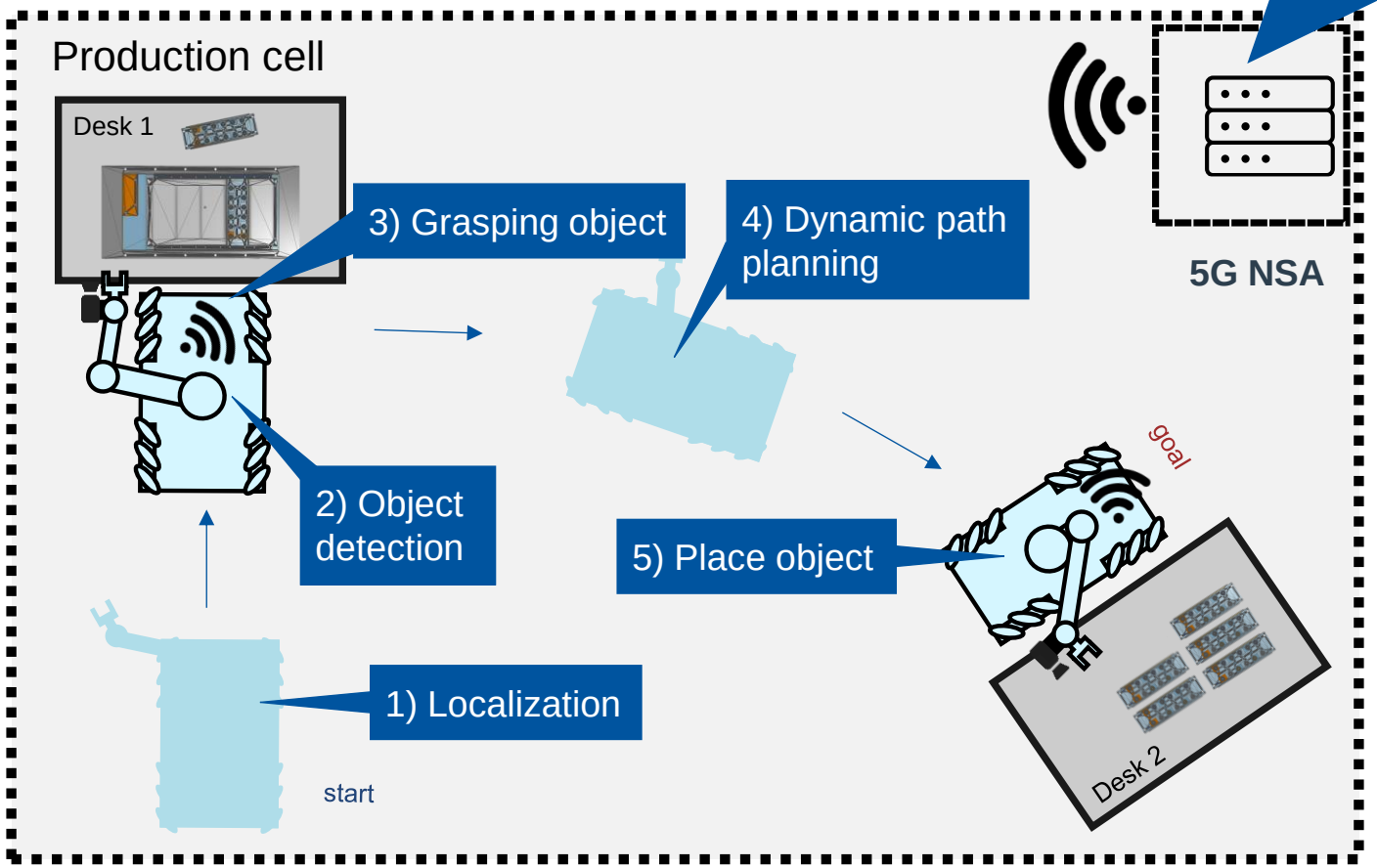
Automated Disassembly

Adaptive disassembly from pack to module

Flexible, automated component remanufacturing addresses the challenges of multi-variant remanufacturing

Use Case | Edge Robotics

Edge-Controlled Automation with Mobile Manipulation



Edge Computing (server)
(Intelligence & Control)

LiDAR 2D, 3D
(Uplink)

Camera Stream
(Uplink)

Control Variables
BASE (Downlink)

Control Variables
ARM (Downlink)

Mobile Manipulator
(Actuators, sensors, drivers)

1-5) Execution of localization, navigation, perception, motion planning and finite state machine on the edge System

What information do we provide per use case?

General description:

- Description
- Step by step evaluation scenarios

Architecture:

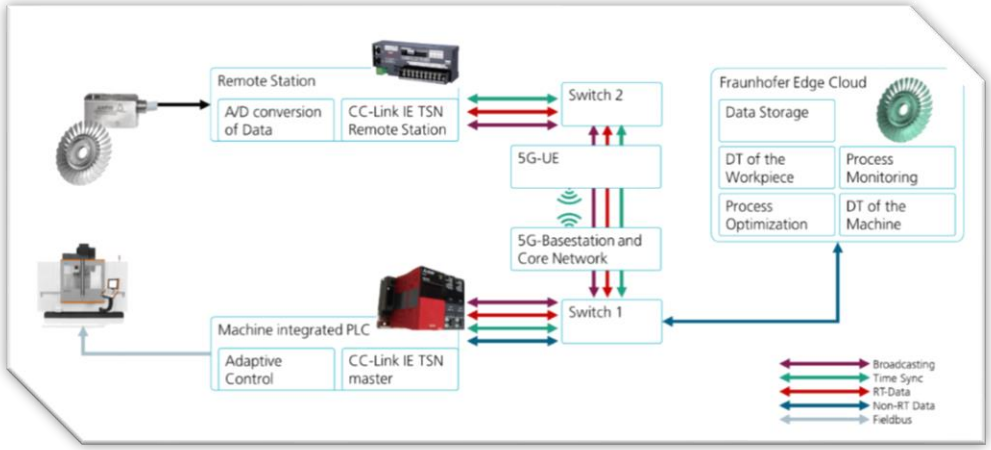
- Considerations from development
- Architecture Diagram

Communication Requirements

- Per data stream
- Latency, data rate, transfer interval, service area, …

KPI / KVI evaluation

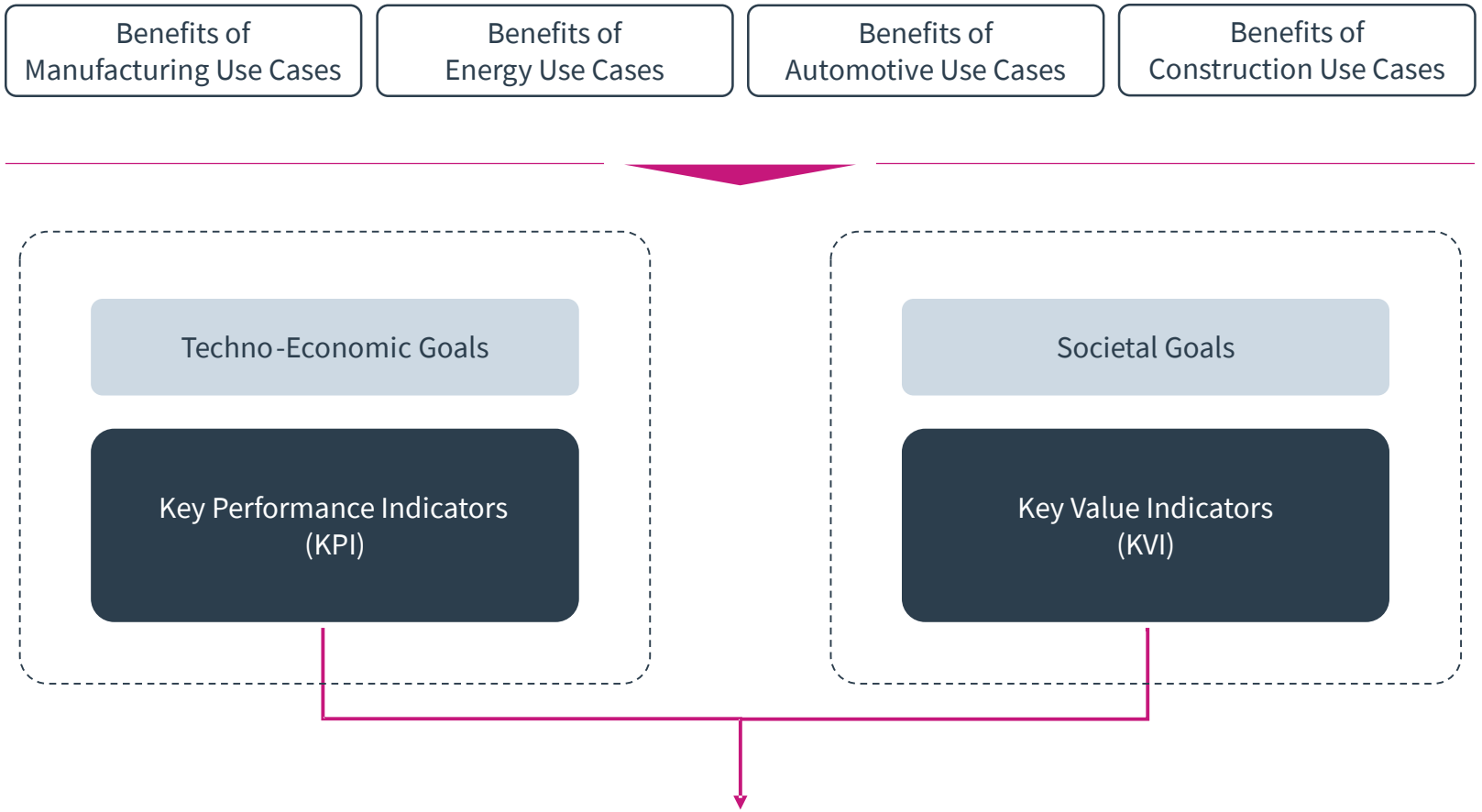
- According to our Methodological Assessment Framework
- Which benefits are tied to the use case?
  - Technical goal
  - User KPI
  - User KVI



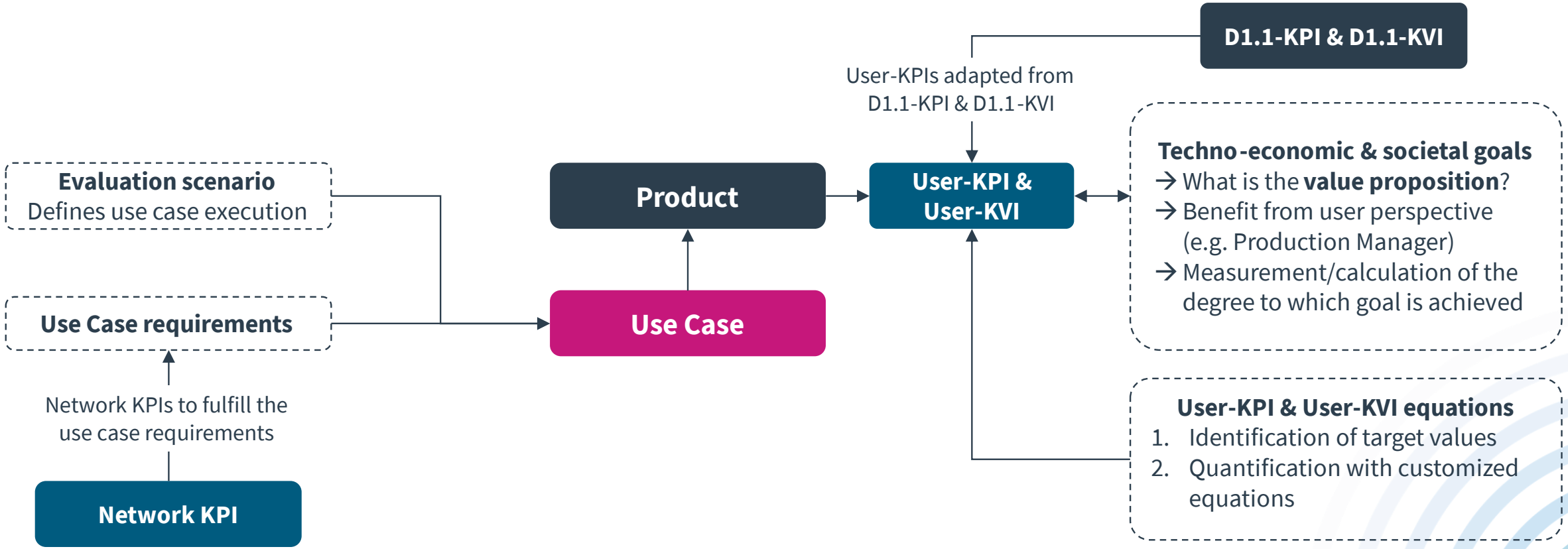
DATA STREAMS		AVERAGE RATES	DATA	DATA STREAMS	AVERAGE DATA RATES	DATA STREAMS
MEASUREMENT (UPLINK)	DATA	< 1 Mbit/sec		< 7 ms	99.999%	99.999%
CONFIGURATION NOTIFICATION (DOWNLINK)	AND DATA	<1 Kbit/sec		NA	99.99%	99.99%

Architecture & communication requirements from the inline quality assurance use case [TARGET-X, D2.4, 2024]

Evaluation of the use cases in TARGET-X

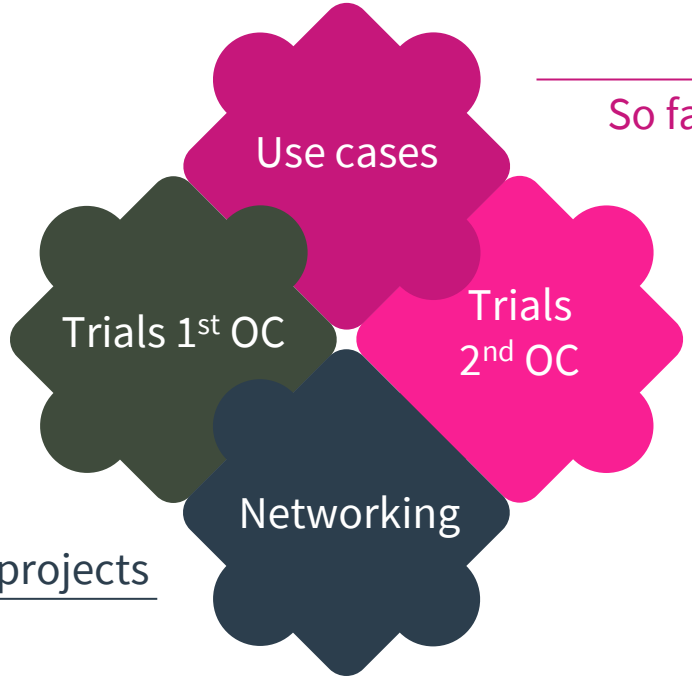


Evaluation of the use cases in TARGET-X



Scale of testing in TARGET-X:

26 FSTP projects (33 entities) tested in the 1st OC



So far, 20+ applications implemented

Currently running:
40 FSTP projects (65 entities)

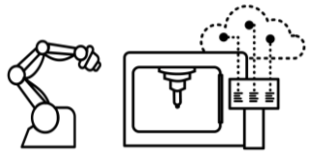
TARGET-X @Automatica 2025
for Dissemination & Networking with FSTP projects

Further reading recommendations

D1.2
Methodological Assessment Framework & KPI/KVI-based evaluation

D9.3
Overview over the current project status

D6.2
Deployment & testing of evolved features



D2.X Manufacturing

D3.X Energy

D4.X Automotive

D5.X Construction

Deliverables available at:
www.target-x.eu
Or at Zenodo:
https://zenodo.org/communities/targetx

TARGET-X

Thank you for your attention!

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