# APPLYING IOT IN AN INDUSTRIAL CONTEXT

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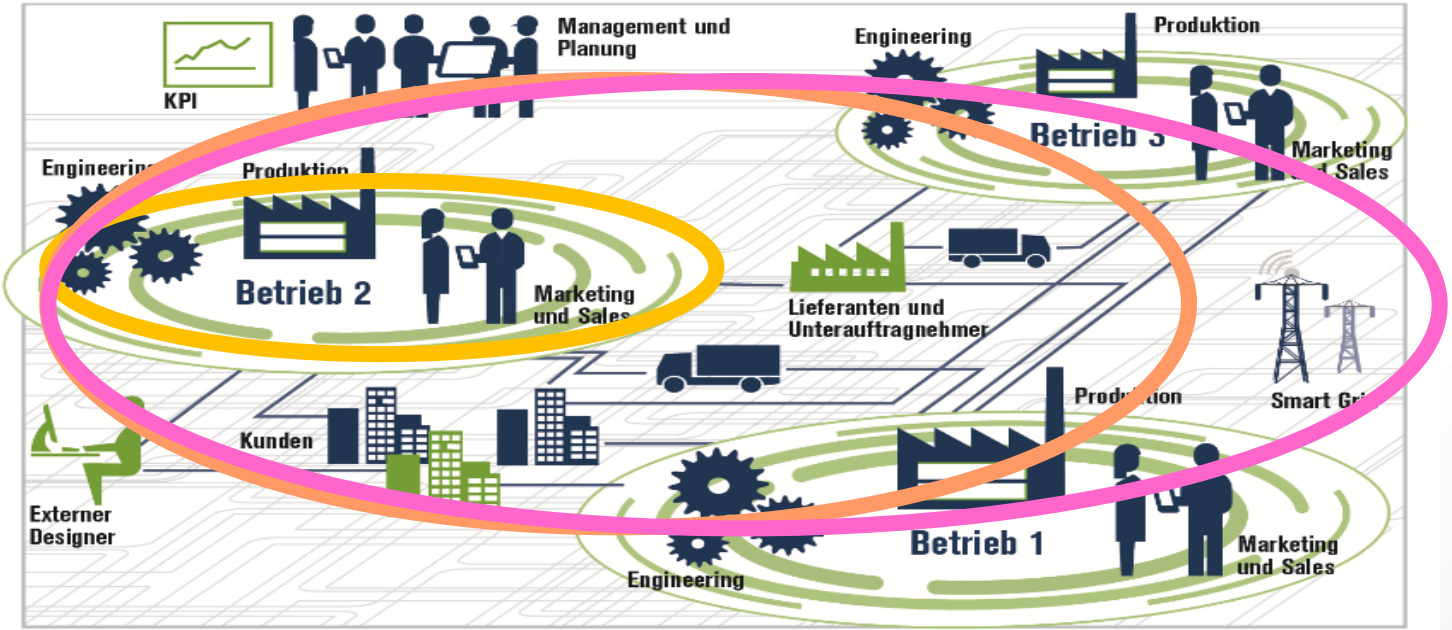
SummerSoc 2018

# INDUSTRY 4.0 – THE ORIGINAL SCOPE




Source: Umsetzungsempfehlungen für das Zukunftsprojekt Industrie 4.0



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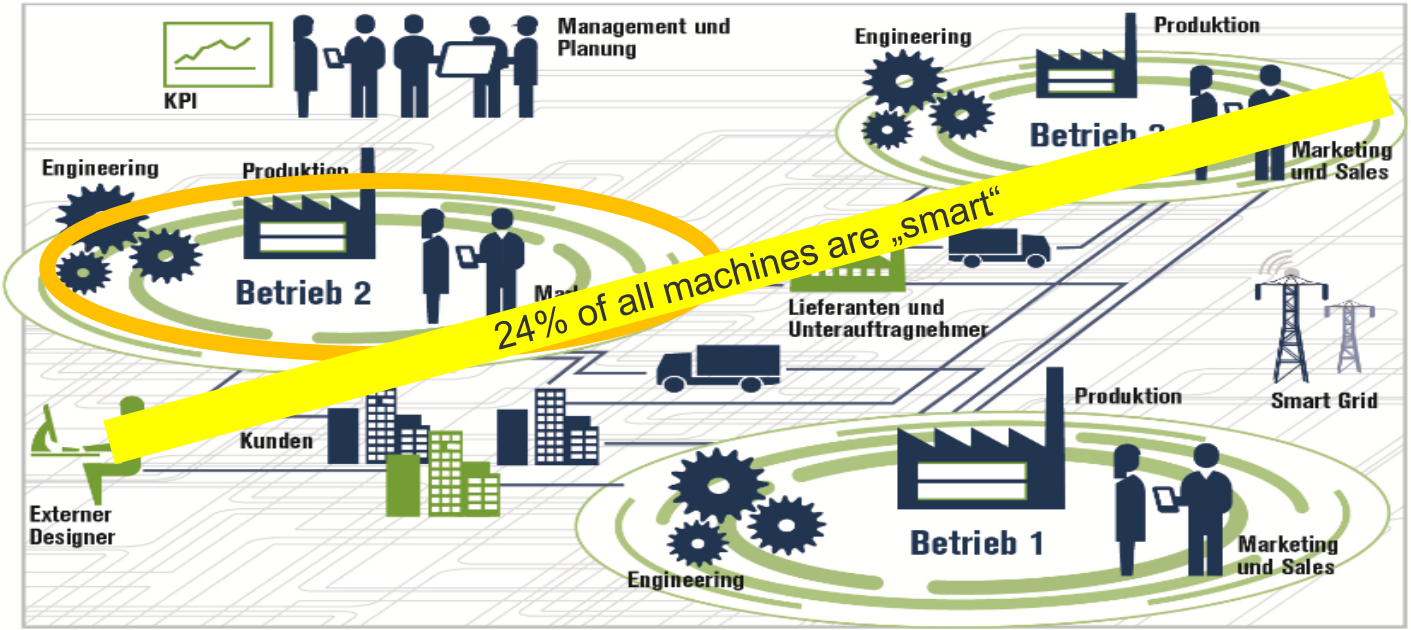
# INDUSTRY 4.0 VS. INDUSTRIAL INTERNET CONSORTIUM

# INDUSTRY 4.0 – INSIDE A SINGLE PLANT




Source: Umsetzungsempfehlungen für das Zukunftsprojekt Industrie 4.0



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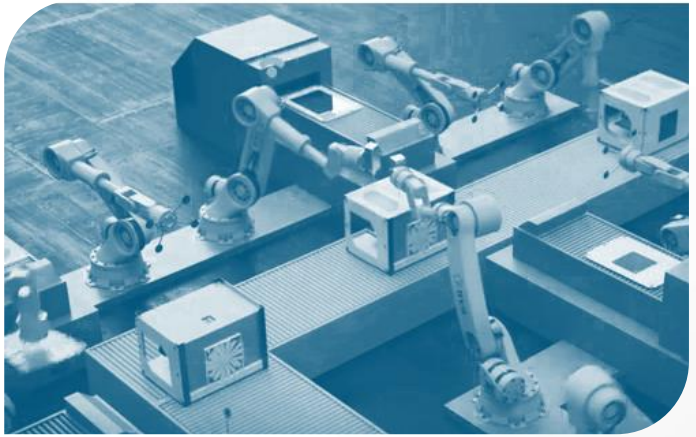
# DISRUPT

## DECENTRALISED ARCHITECTURES FOR OPTIMISED OPERATIONS VIA VIRTUALISED PROCESSES AND SUPPLY-CHAIN COLLABORATION

Next-generation manufacturing throughout the entire value chain monitored and controlled via the IoT



### Application and Research Partners

ATC ATHENS TECHNOLOGY CENTER

arçelik

CRF

SIMPLAN

MANCHESTER 1824 The University of Manchester

to di Tecnologie Industriali e Automazione Consiglio Nazionale delle Ricerche

www.boc-group.com

ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

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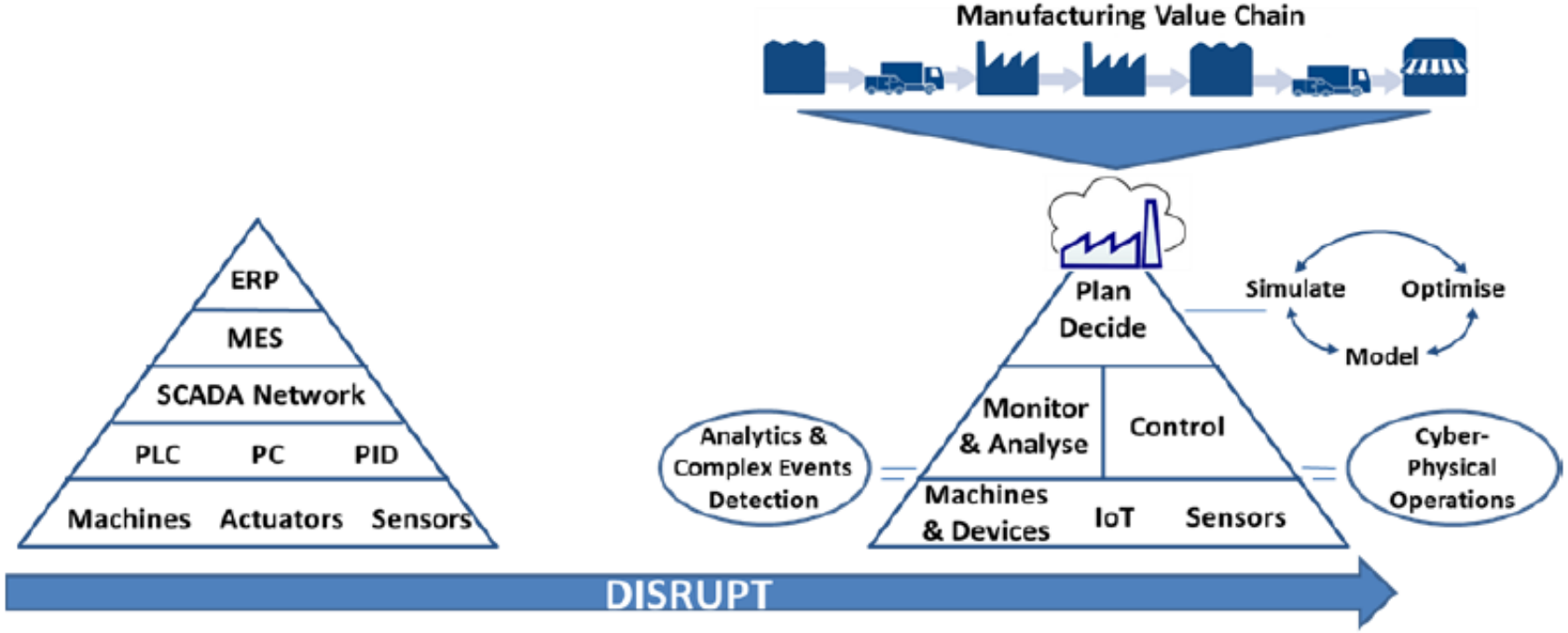
# PROJECT OBJECTIVE



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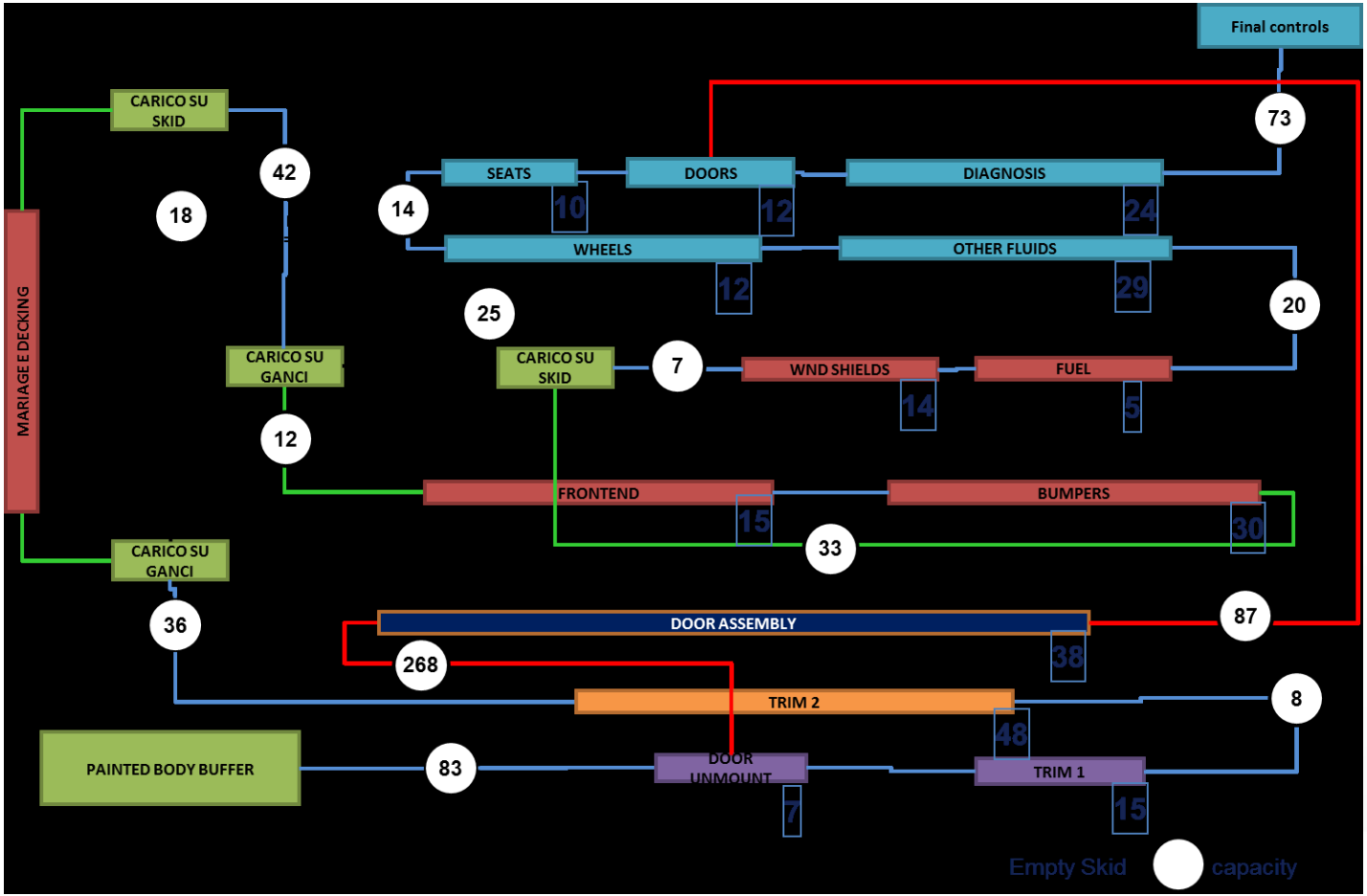
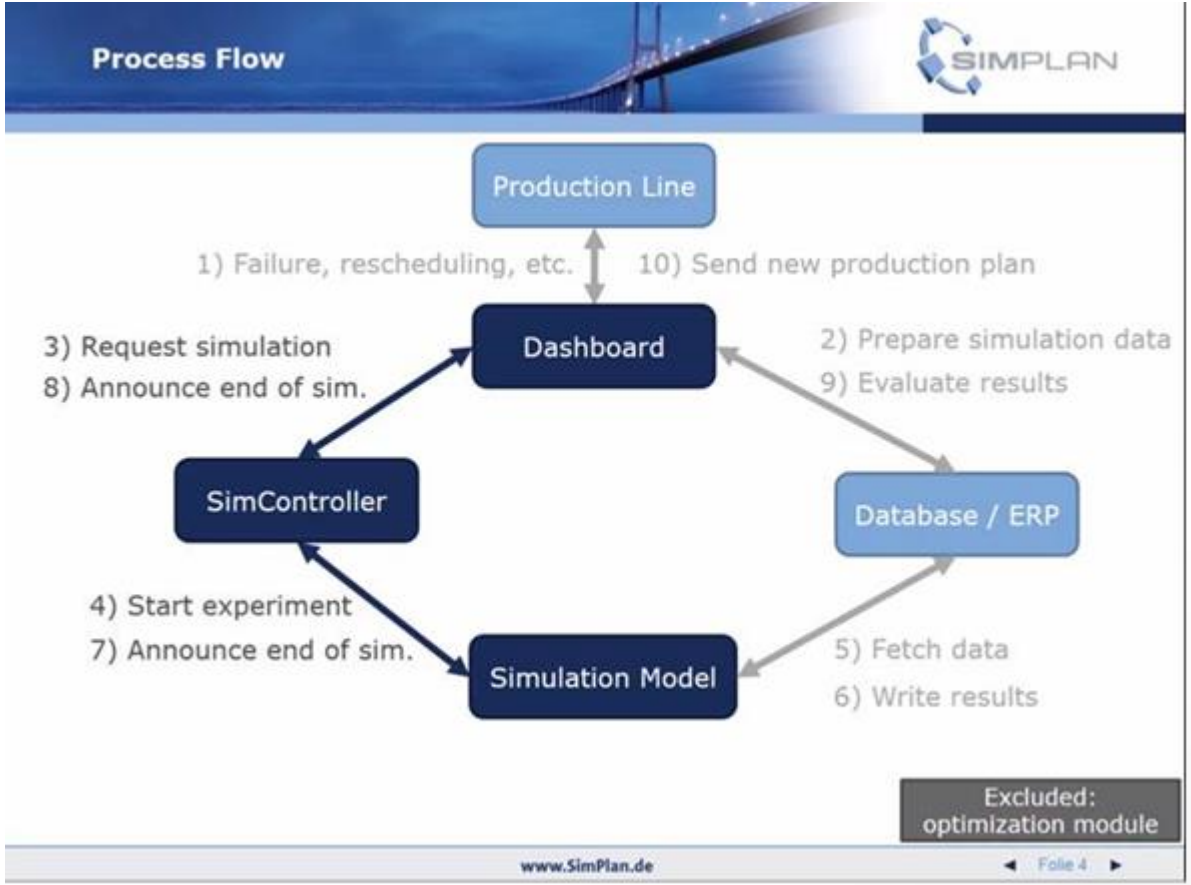
# AUTOMOBILE FINAL ASSEMBLY PROCESS FLOW



# CAR PAINTING PROCESS FORECAST

- Interfaces to “shopfloor” –
  Connecting to real time data from car painting cell
- Continuous monitoring of the dynamics of color quality evolution
- Estimate the number of cars until “bad” quality is reached
- Trigger SIMPLAN simulation from CEP
- Monitor simulation jobs/status

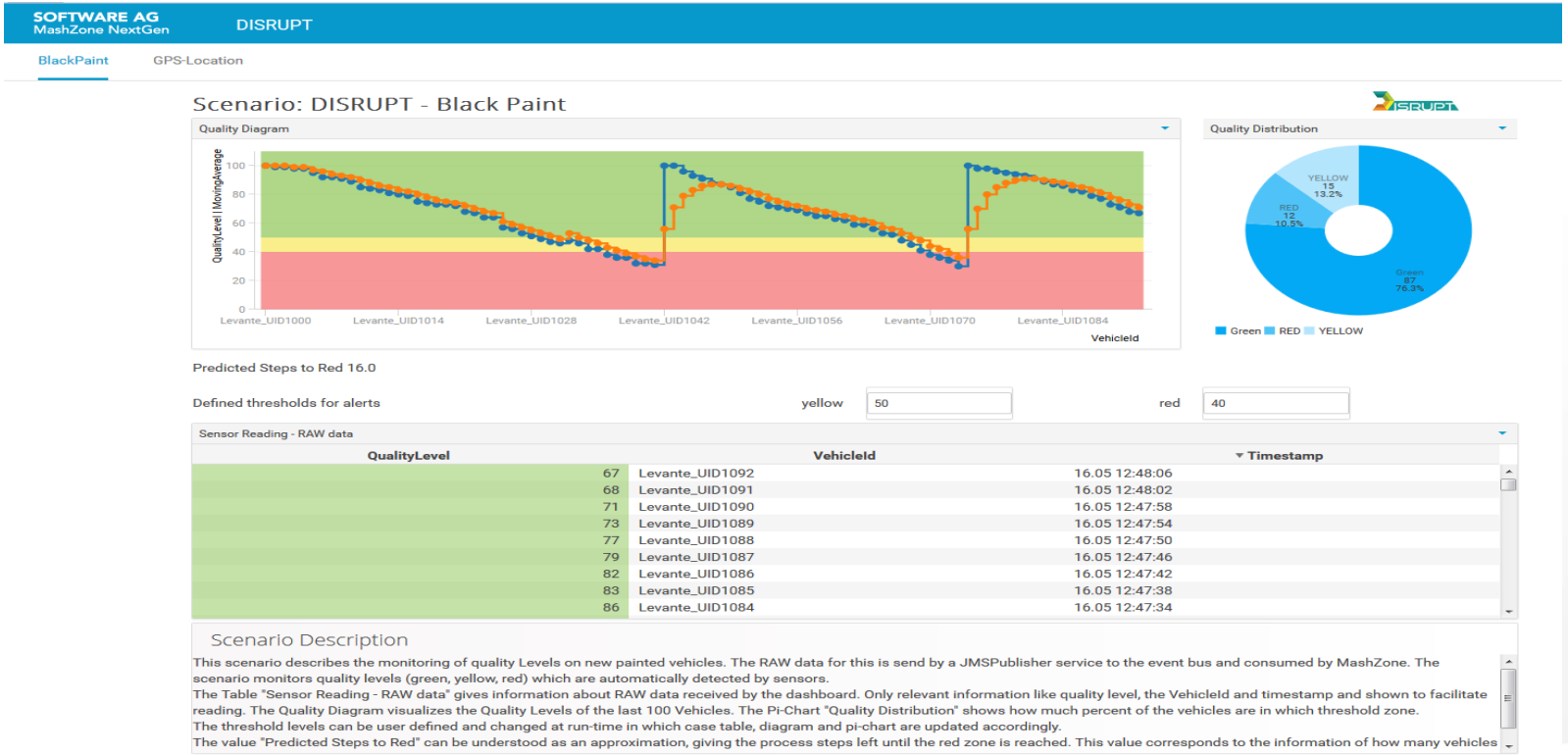
 



# COLOR PAINTING MONITORING





# PREDICT FAILURES OF TWISTLOCKS
BASED ON ML

PALUNO
The Ruhr Institute for Software Technology
UNIVERSITÄT DUISBURG ESSEN
Open-Minded

TRANSFORMING TRANSPORT

duisport

## Logistic Terminal

## Crane

## Twistlock

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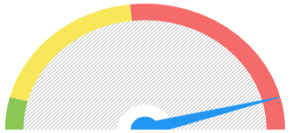
| CRANE | MOVES SINCE MAINTENANCE | TOTAL WEIGHT MOVED [t] | DAYS SINCE MAINTENANCE | PREDICTED DAYS UNTIL NEXT FAULT |
|---|---|---|---|---|
| DU-HB-1 | 10,812 | 1,942,325 | 182 | 20 |
| DU-HB-2 | 12,398 | 1,942,325 | 183 | 63 |
| DU-HB-3 | 43,671 | 245,692 | 20 | 180 |
| DU-HB-4 | 55,789 | 106,721 | 73 | 127 |

TRANSFORMING TRANSPORT

## DU-HB-1

Moves since maintenance
10,812



Total weight moved
1,942,325

Days since maintenance
182

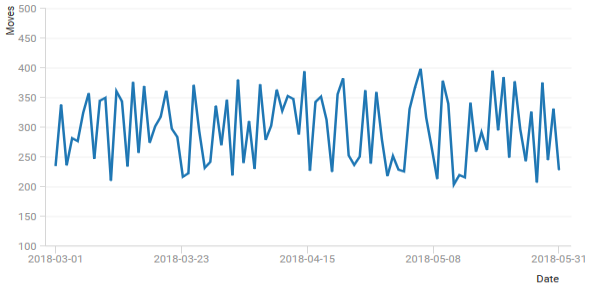
Predicted days until next fault
20

## Status Twistlocks

Left
80.00

Right
70.00

### Moves per day




FROM

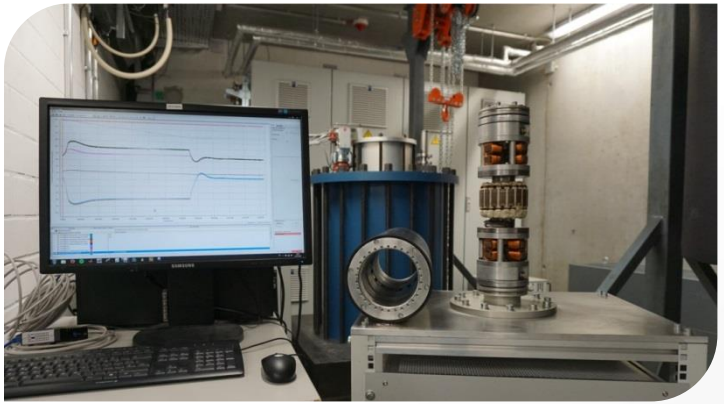

### Moved weight per day


TO

# PHI-FACTORY

## FLEXIBLE ELECTRONIC PLANT NETWORKING

Flexible production to adapt power consumption to the actual grid condition



## Application and Research Partners

PW TU DARMSTADT

TECHNISCHE UNIVERSITÄT DARMSTADT

iMS

Elektrische Energieversorgung unter Einsatz Erneuerbarer Energien

ÖKOTEC ENERGIEMANAGEMENT GMBH

entega

mpdv

OPEL

Rexroth Bosch Group

funded by

Federal Ministry for Economic Affairs and Energy

## Software AG's technologies used

Apama Streaming Analytics, Zementis Predictive Analytics, MashZone NG Dashboards, Cumulocity IoT

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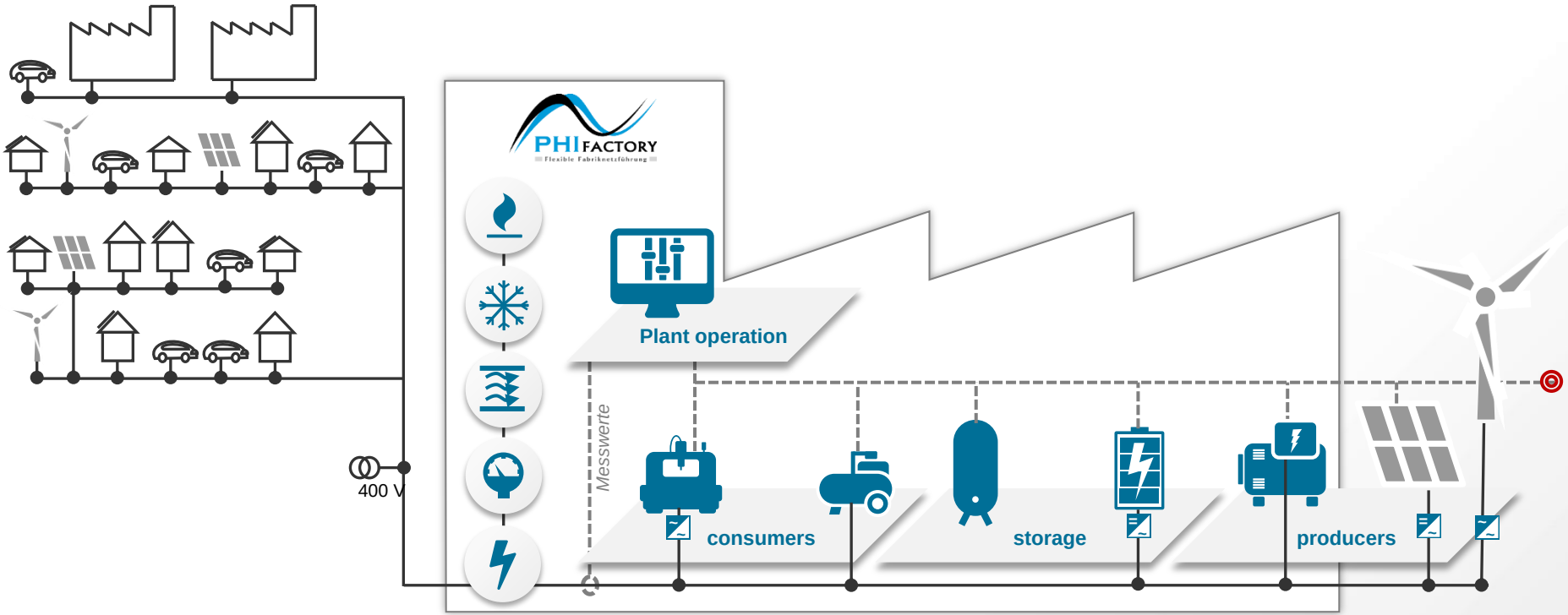
# PHI FACTORY

## FLEXIBLE ELECTRONIC PLANT NETWORKING (ENERGY PRODUCTION AND COMSUMPTION, BULDING AUTOMATION ETC.)



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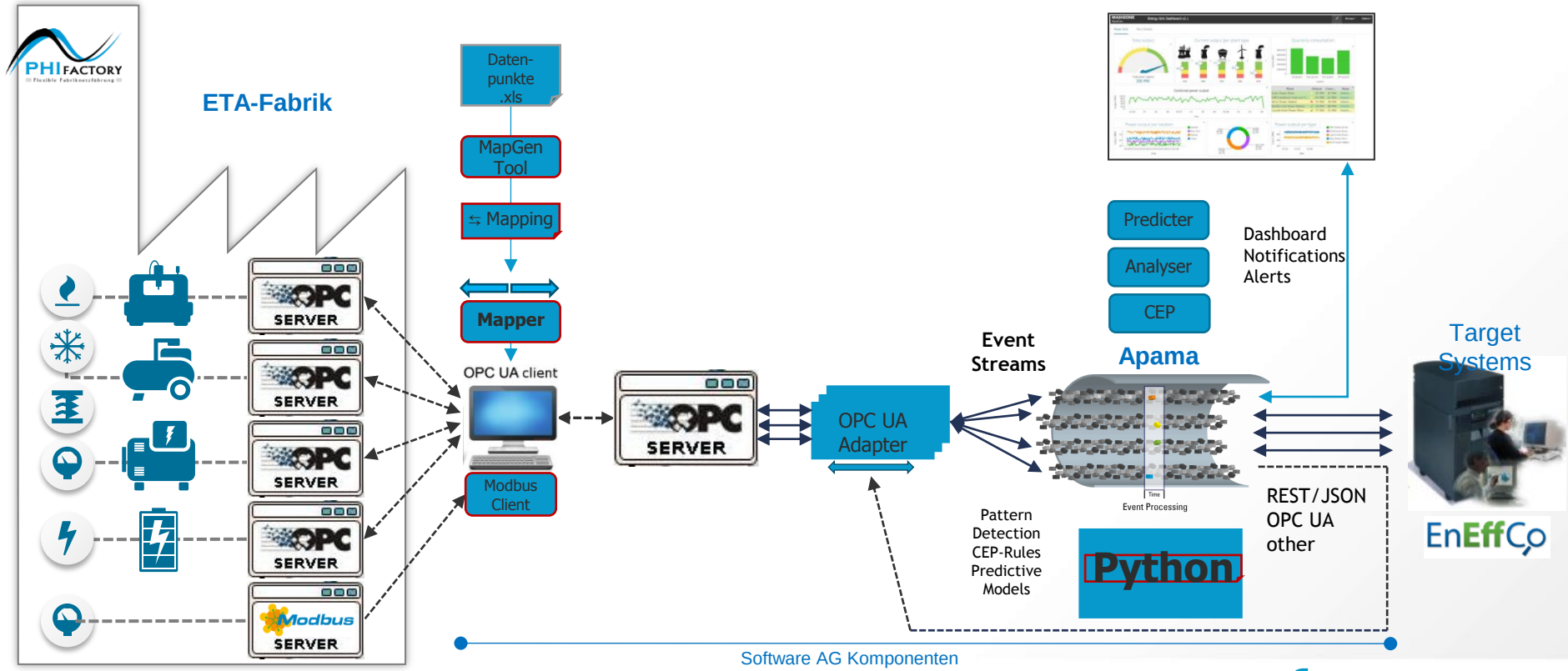
# DATA CONSOLIDATION



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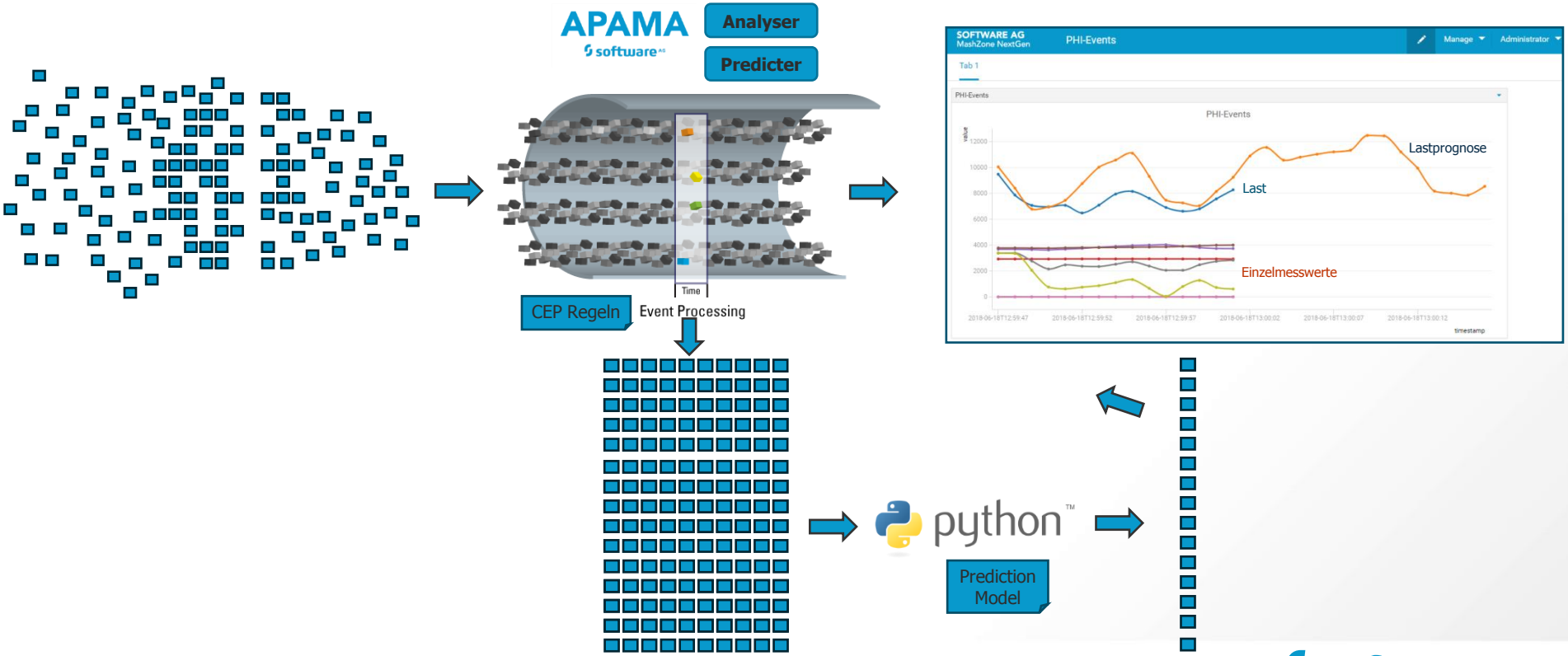
# PYTHON-BASED PREDITION



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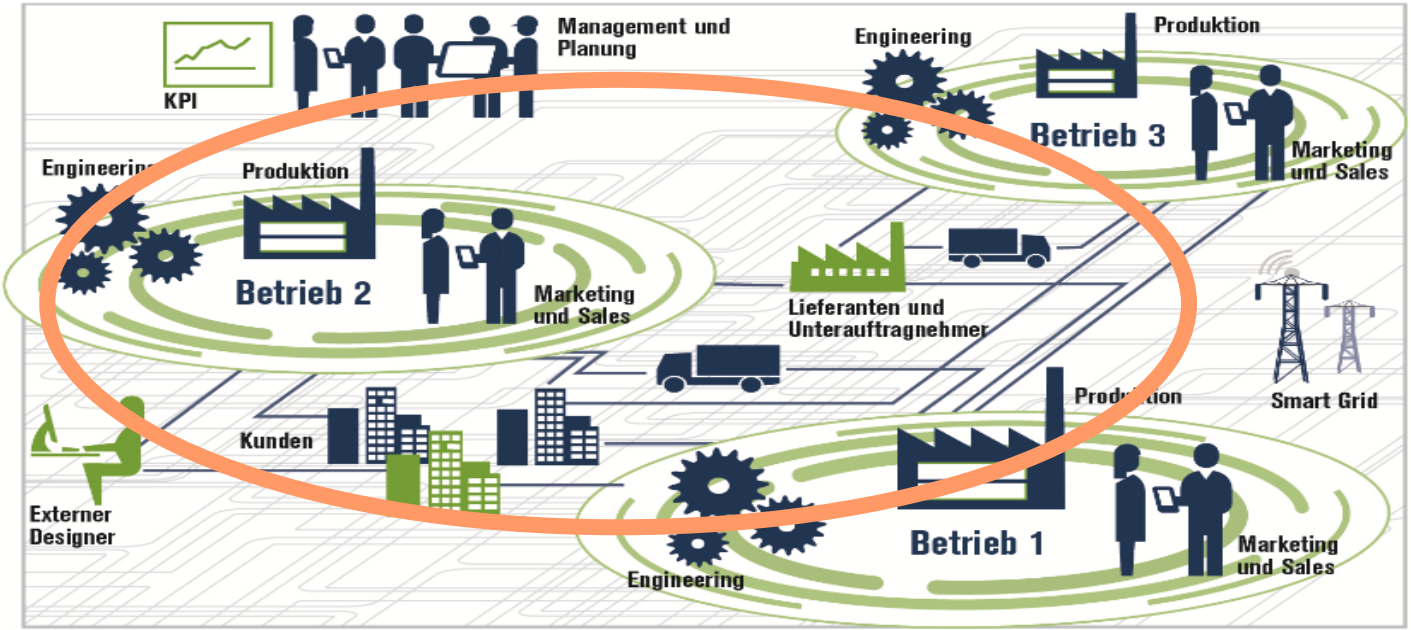
# THREE PROJECTS – THREE PREDICTION METHODS

- Simulation – simulation tool required
- ML-based models – large amount of data required
- Handcrafted models – domain knowledge required

- In all three cases combined with streaming analytics

# INDUSTRY 4.0 – COVERING THE VALUE CHAIN




Source: Umsetzungsempfehlungen für das Zukunftsprojekt Industrie 4.0



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# LOGISTAR
# ENHANCED DATA MANAGEMENT TECHNIQUES FOR LOGISTICS PLANNING AND SCHEDULING IN REAL TIME

Effective planning and optimizing of transport operations in the supply chain by using a real-time decision making tool and a real-time visualization tool of freight transport


## Application and Research Partners

Deusto Universidad de Deusto
pladis GODIVA MYLLYKOSKI ÜLKER
UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh
dbh dbh Logistics IT AG
Consorzio ZAILOG
Nestlé
FRESH SOLUTIONS
GENEGIS Geographical Intelligence
SEMANTIC WEB COMPANY
DUNAV NET
MDS Transmodal Ltd
ahlers
CODOGNOTTO
CSIC Consejo Superior de Investigaciones Científicas

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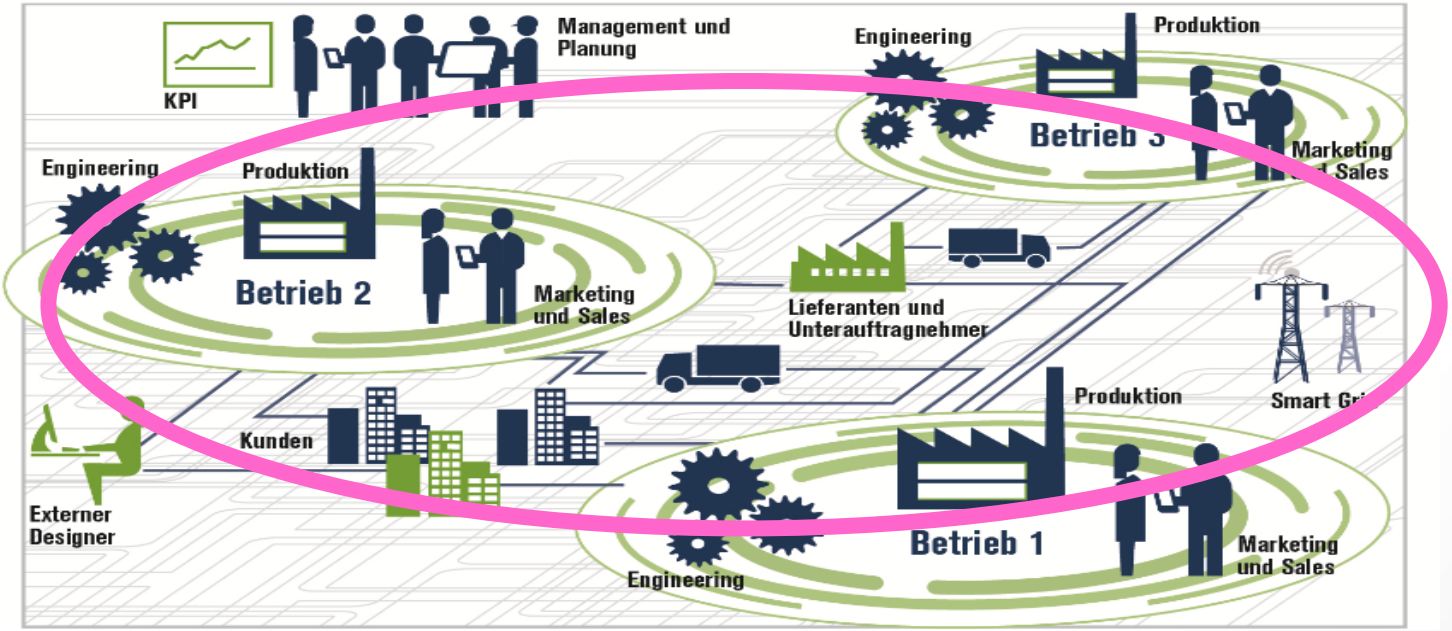
# INDUSTRY 4.0 – COVERING THE ECO SYSTEM




Source: Umsetzungsempfehlungen für das Zukunftsprojekt Industrie 4.0



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# SYNERGIE
## SYSTEM-OPTIMISING GRID AND ENERGY MANAGEMENT FOR THE DISTRIBUTION NETWORKS OF THE FUTURE

New ways of optimizing the reactive power balance of distribution networks


### 98 Application and Research Partners, among them:

Aachener Verfahrenstechnik | RWTH AACHEN UNIVERSITY

TECHNISCHE UNIVERSITÄT DARMSTADT

SIEMENS DAIMLER steag NEW ENERGIES trimet

### Software AG's technologies used

ARIS Architect, ARIS UML Designer, webMethods Integration Platform, CentraSite, Universal Messaging & Apama

Federal Ministry of Education and Research

 

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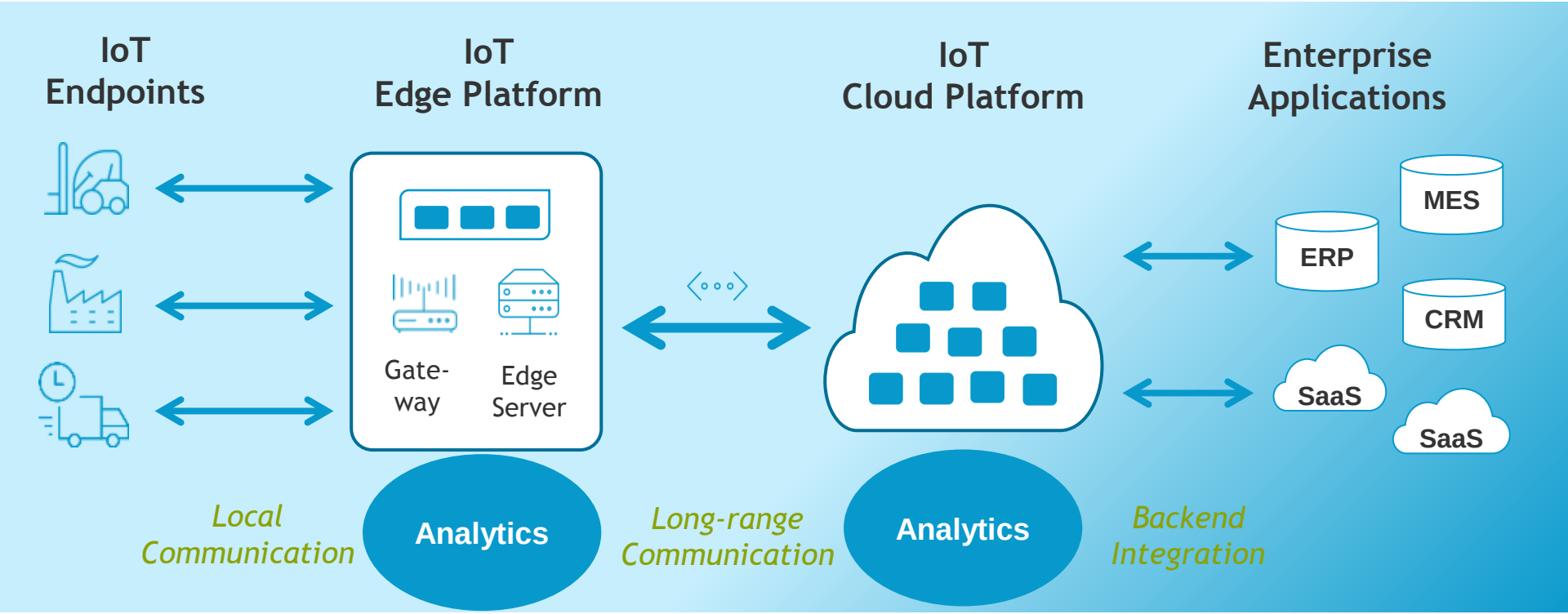
# TECHNICAL BACKBONE: SOFTWARE AG'S CUMULOCITY
## IOT PLATFORMS ARE DISTRIBUTED



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# VISION: IOT SOLUTION BUILDING SHOULD BE THAT SIMPLE

## CONNECT DEVICES

Connect a new device, consume live data and be able to trigger operations

**< 5 minutes**

## ANALYTICS & DASHBOARDS

Apply common analytics rules and create real-time interactive dashboards

**< 10 minutes**

## INTEGRATE APPLICATIONS

Integrate with existing enterprise applications and cloud services

**< 10 minutes**

## BUILD APPLICATIONS

Build & deploy data-driven applications easily to drive business value

**< 30 minutes**

 

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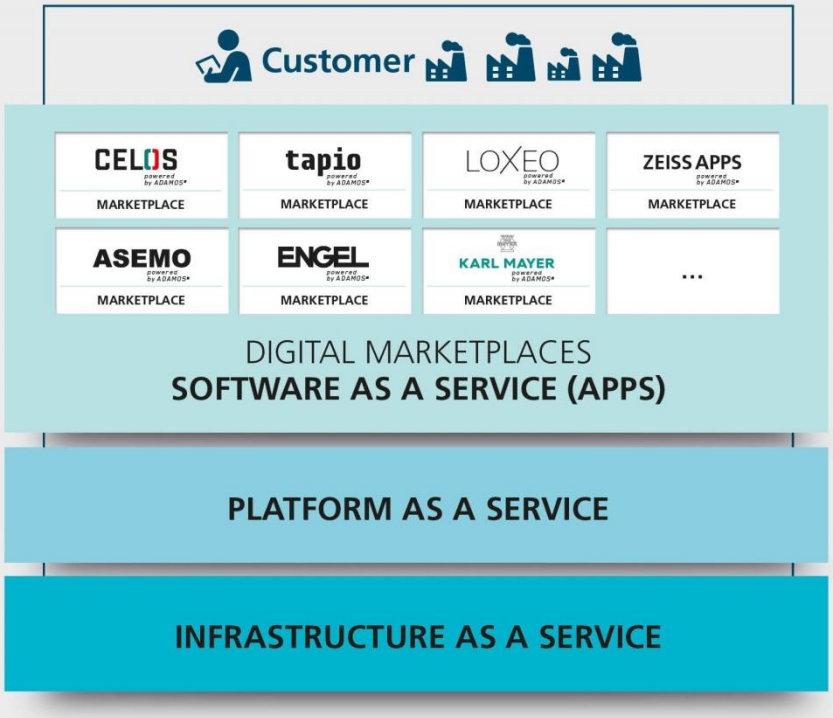
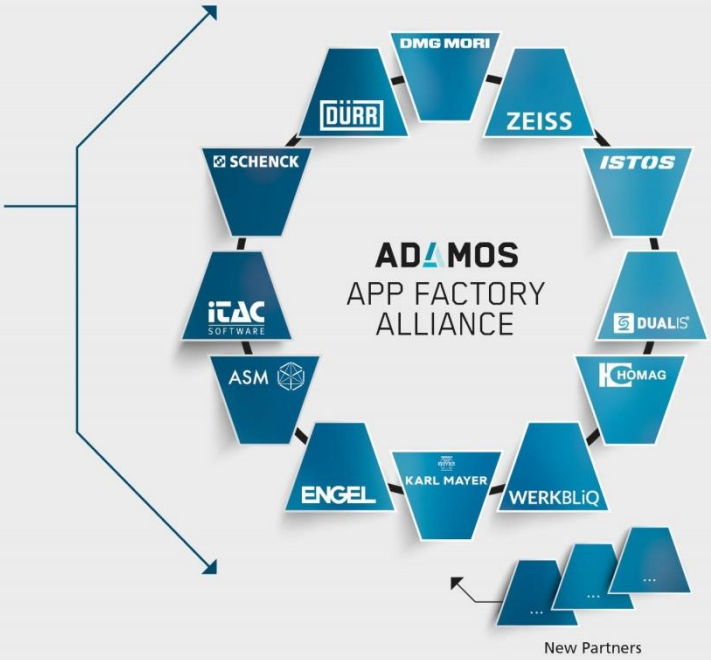
# ADAMOS INDUSTRY ALLIANCE



# ADAMOS PARTNER PROJECTS

## PAINT ROBOT DATA VISUALIZER
DÜRR

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|

## EcoPRO PLANT ANALYTICS @VW
DÜRR

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|


## LIFECYCLE ASSISTANT
DÜRR

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|

## EDGE ANALYTICS BUILDER @BMW
DÜRR

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|


## MACHINE DASHBOARDS @DIRKS
DÜRR

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|

## METROTOM MONITOR
ZEISS

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|

## NET BOX DEVICE MANAGER
DMG MORI

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|

## CELOS MESSENGER
DMG MORI

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|

## PRODUCTION DASHBOARD (OMI)
ASM

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|

## MACHINE FACEBOOK
ASM

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|

## ER 131
KARL MAYER

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|


## PRODUCTION PLANNING
DMG MORI

| INIT | PLAN | DO | TEST | ROLL-OUT |
|---|---|---|---|---|