KoçDigital

With BCG
The Boston Consulting Group

Platform360 Industrial IoT Solutions
using Azure Services

KoçDigital IoT Solution Portfolio

KoçDigital
With BCG
The Boston Consulting Group

Platform360 Industrial IoT Solutions

USING MICROSOFT AZURE

TABLE OF CONTENTS

Digital Transforms Manufacturing Projects

Incentive	Operational Needs	Business Value
Decision Makers	Manufacturing field workforce	CIO, CDO, CTO
Governance	Variety of vendors for piecemeal traceability	End-to-end manufacturing transparency
Suppliers	Automation Firms	IoT firms, Digital Transformation firms
Technology	Monitor basic KPIs with manual input	Connected Digital twin of manufacturing

Source: KoçDigital

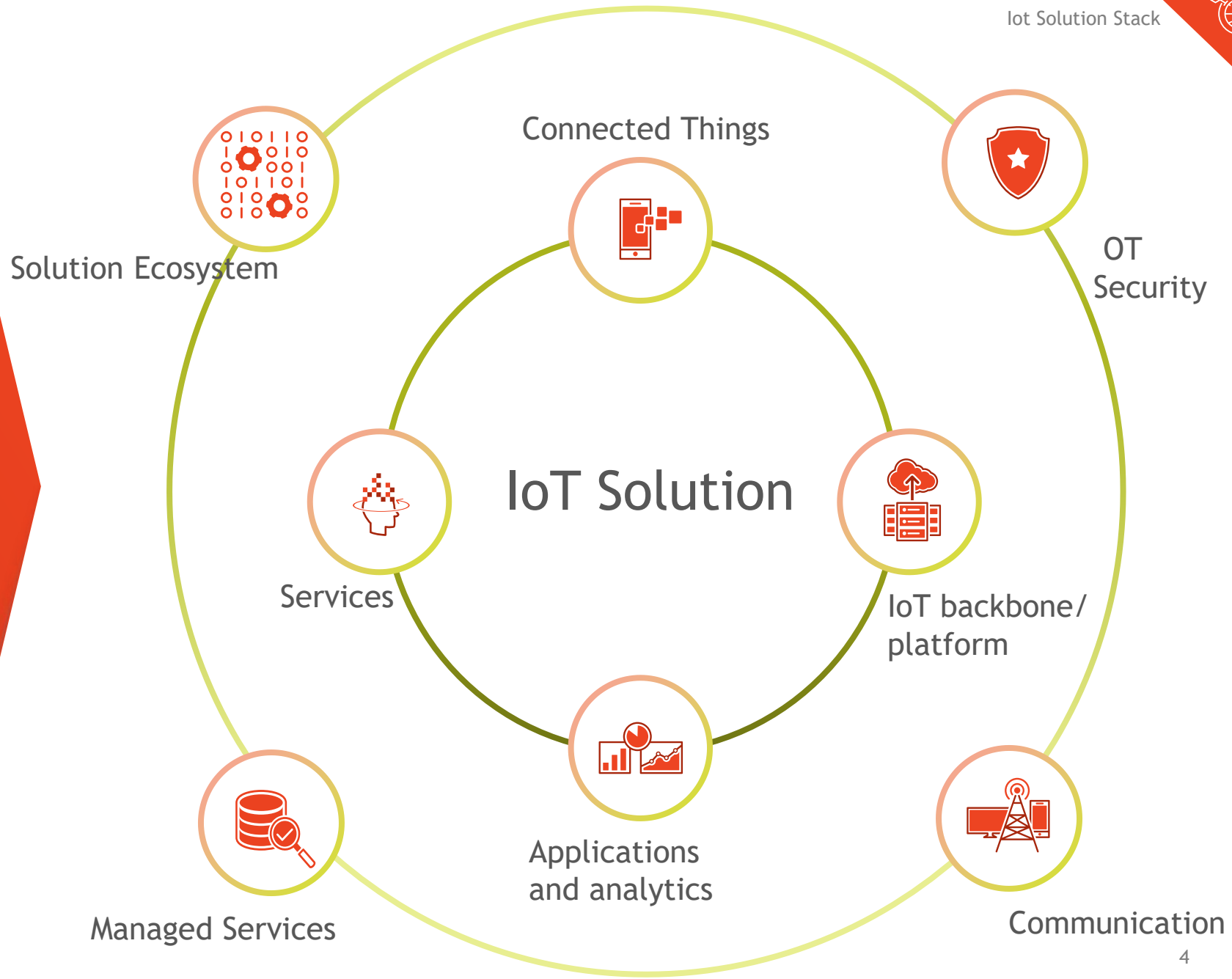
WHY DO WE NEED INDUSTRIAL IOT?

Increase Efficiency

Improve Quality

Increase Safety

KoçDigital is **IoT System Integrator** which provides end-to-end solutions



KoçDigital With BCG The Boston Consulting Group

Engaging in IIoT based digital manufacturing solutions create substantial impact

Industrial IoT creates business values, increases productivity, and customers gets/stays competitive

Throughput increase with horizontal product line optimization
5-10%

Reduction of unplanned downtime
50-70%

Reduction of spare parts usage
15-20%

Increase in engagement of maintenance teams
35-50%

Increase in equipment uptime
10-20%

Eliminate process related production downtimes
100%

Decreased Energy Usage
5-10%

Eliminate paper based processes
100%

Source: KoçDigital Customer Insight

KoçDigital
With
BCG
The Boston Consulting Group

Platform360 Industrial IoT Solutions

USING MICROSOFT AZURE

TABLE OF CONTENTS

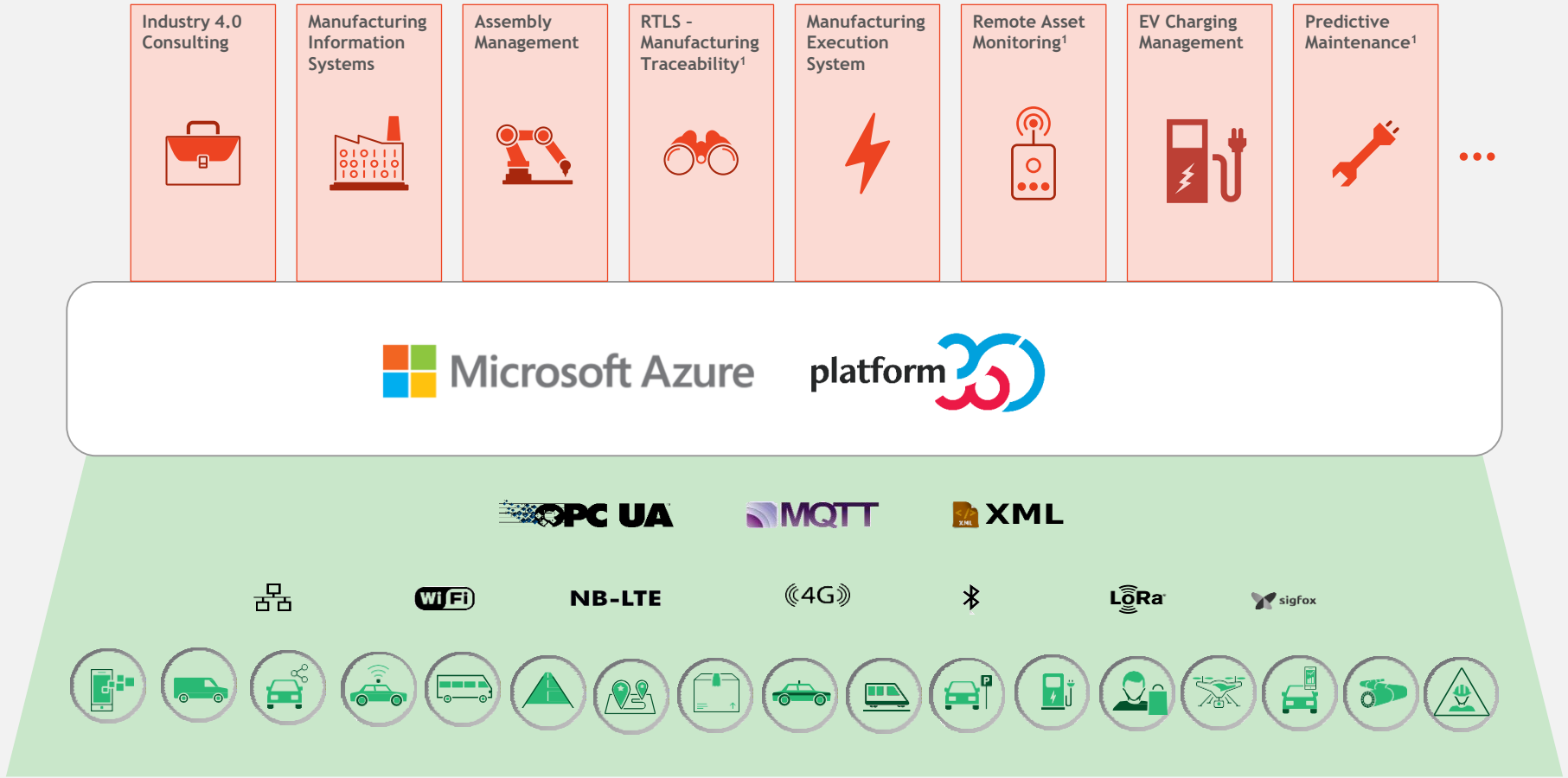
KoçDigital's solution set to digitize existing/new factories

Manufacturing Execution Platform

Source: KoçDigital

Industrial IoT Platform (IIoT Platform)

Platform360 is the common service layer, enabling numerous Industrial IoT Applications & Analytics



Source: KoçDigital

Platform360 is based on OneM2M, the global standards initiative for Machine-to-Machine and IoT technologies

The purpose of OneM2M is to specify, promote and maintain a Common IoT Service Layer allowing every component to communicate as one system

It provides a flexible architecture to accommodate a variety of device platforms

Provides technical support artifacts …

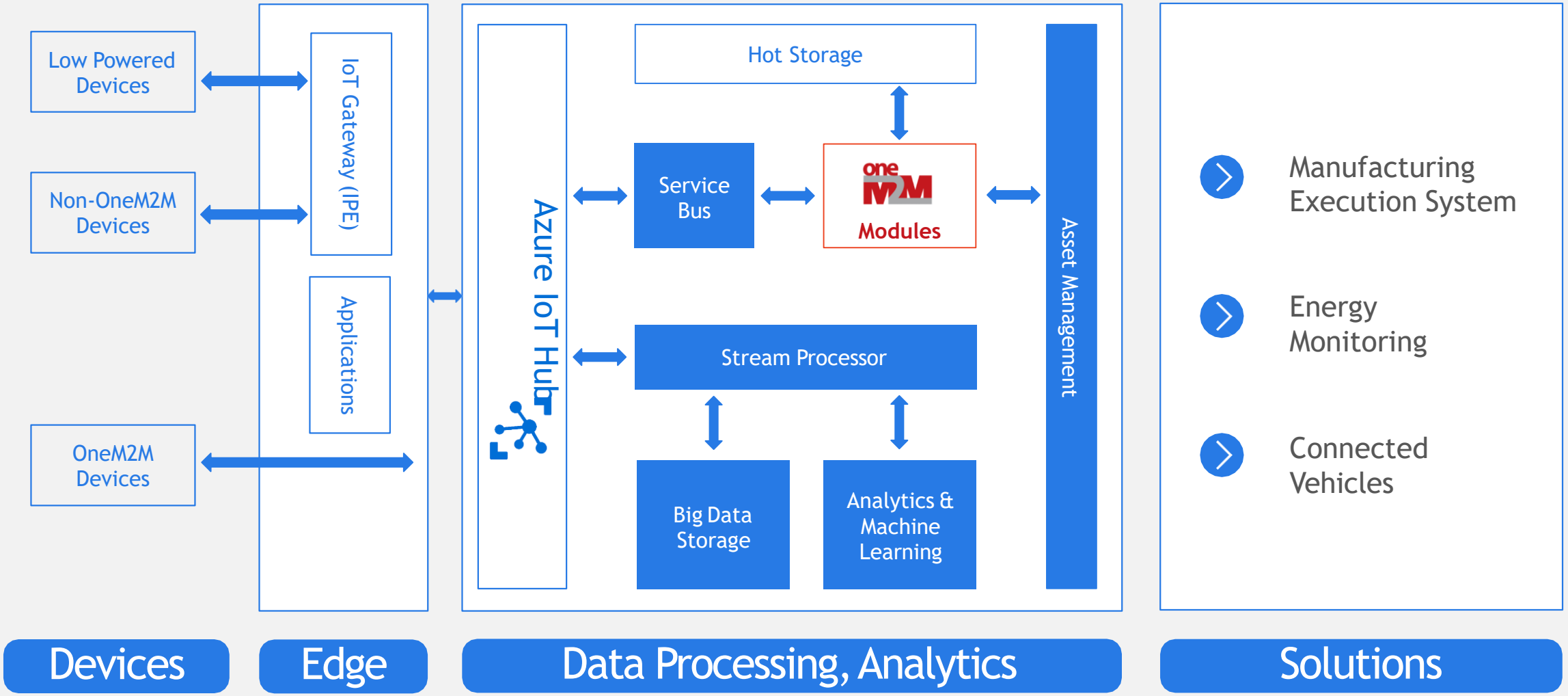
- Requirements
- Architecture
- API specifications
- Security
- Interoperability

Used across industries …

- Home automation
- eHealth
- Industrial automation

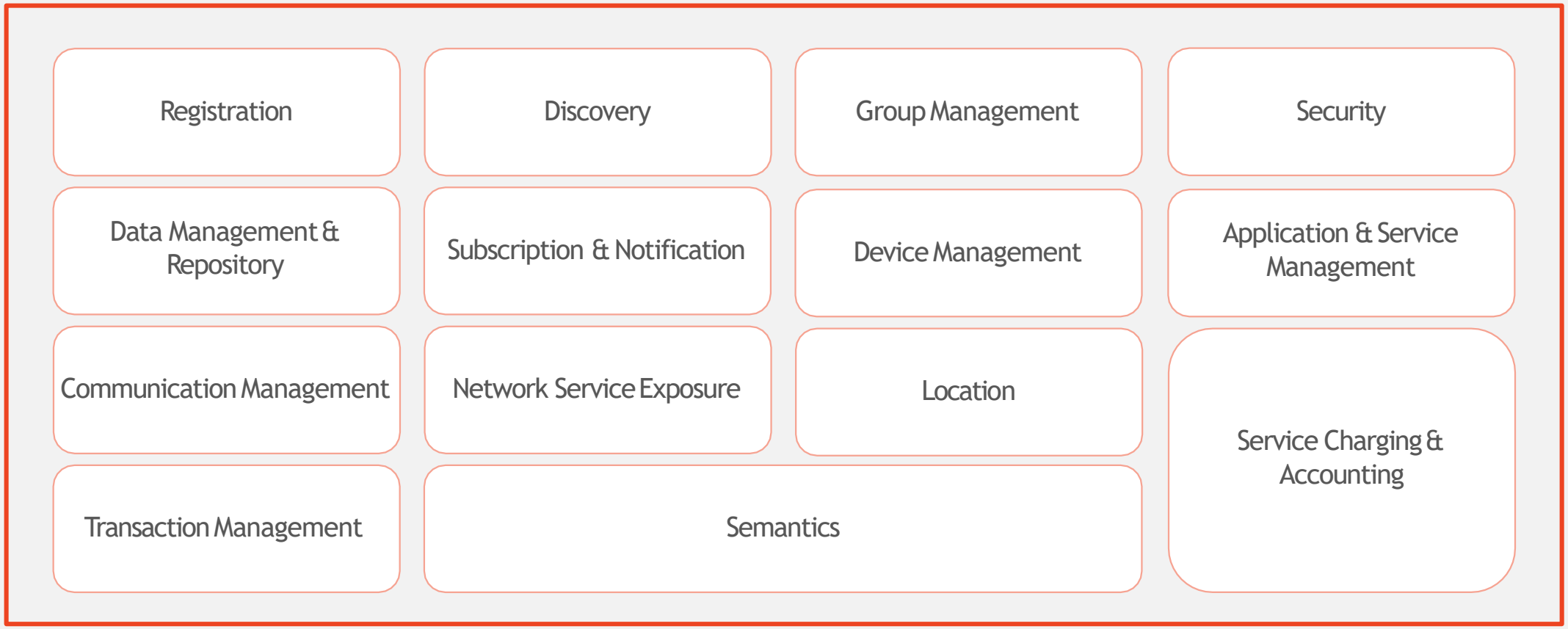
Over 200 participating partners and members …

Platform360 on Azure



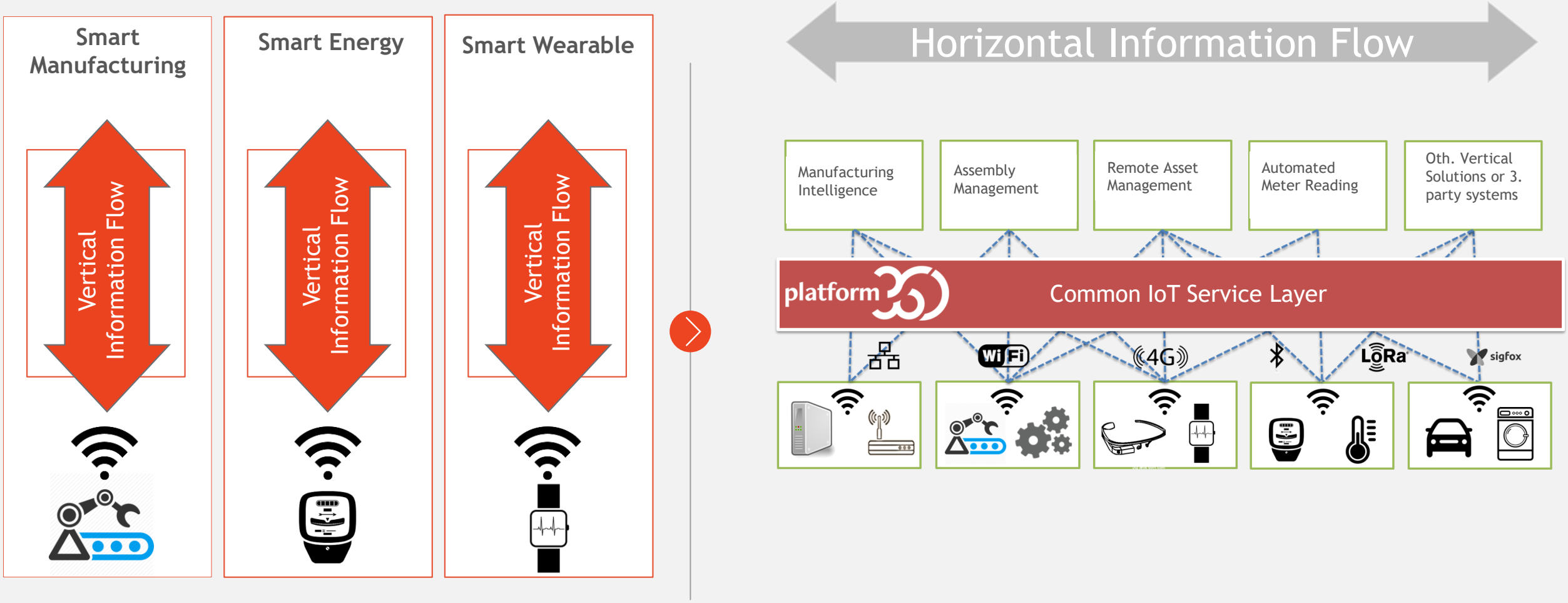
"OneM2M module" content will be shown on the next page

OneM2M Modules



Horizontal IoT Platform

Platform360 provides horizontal information flow with Azure Services



KoçDigital With BCG The Boston Consulting Group

Self Service Dashboard

Visualization of IoT Daa

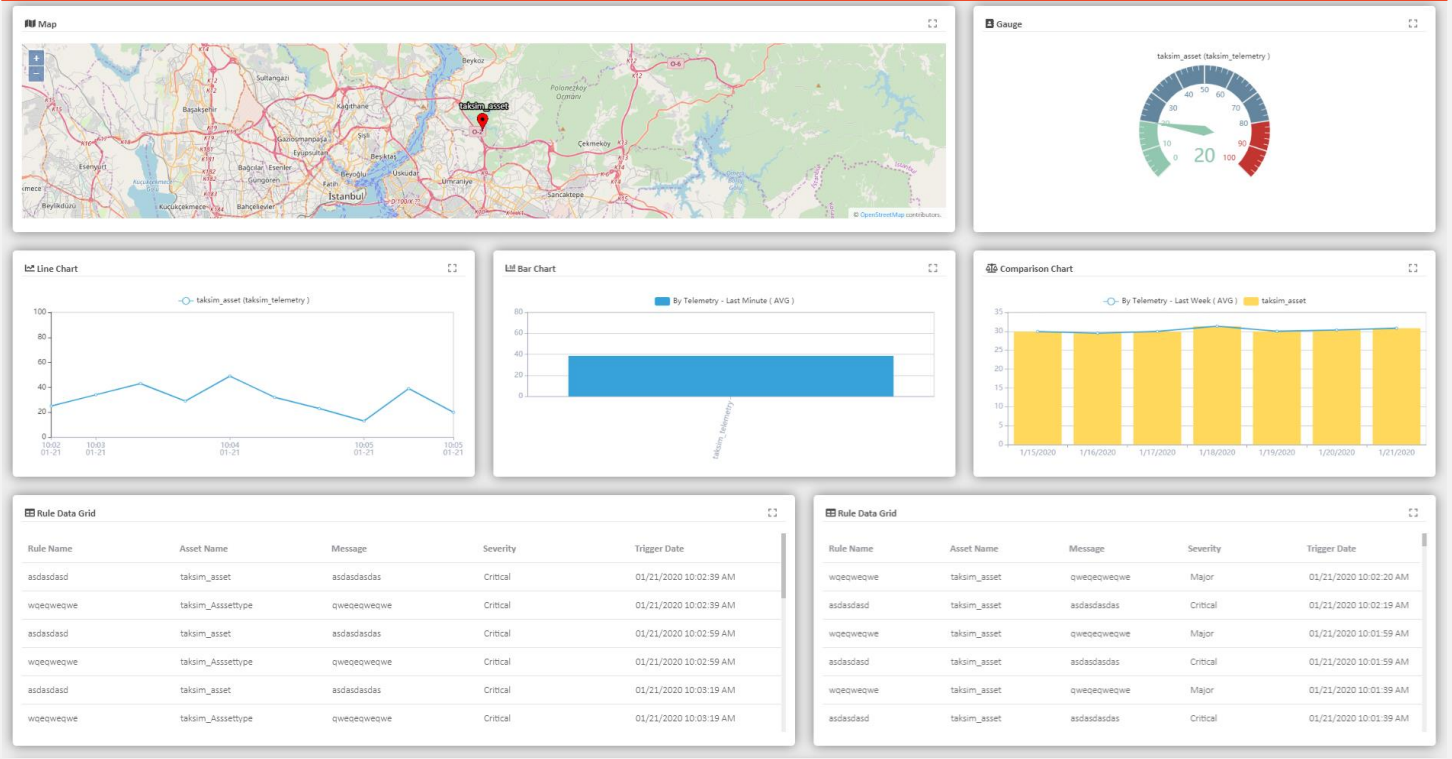
Self Service :
Widgets allow designing user-defined dashboard views

Stream Data:
Investigate real-time data streams/events in real-time

Query Data:
Investigate existing data using data queries

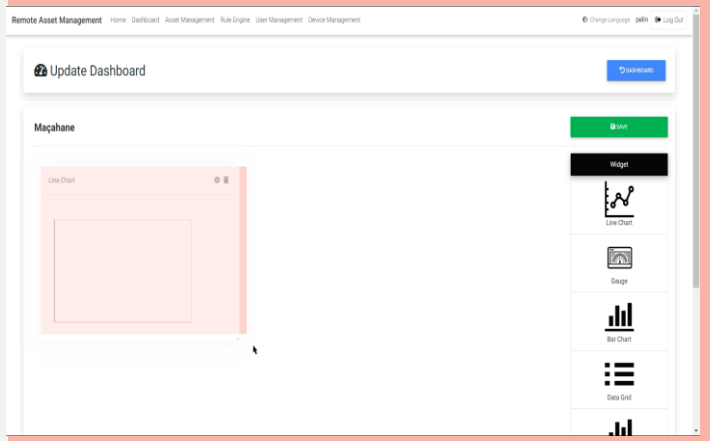
Map Layer:
Visualize location services and monitor device positions

User Defined Dashboard Views

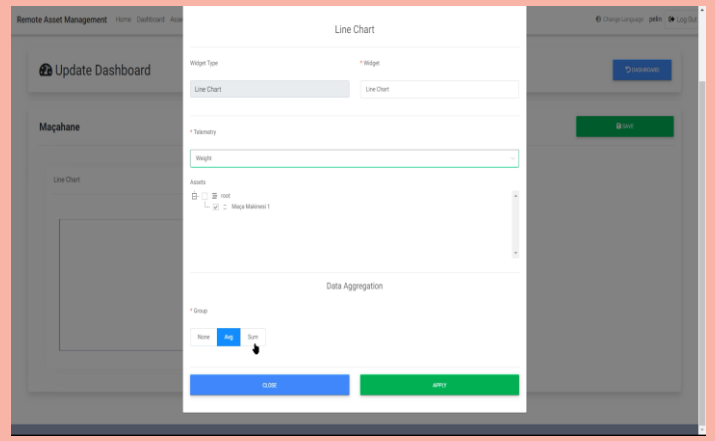


3-Step Approach for Self-Service IoT Dashboards

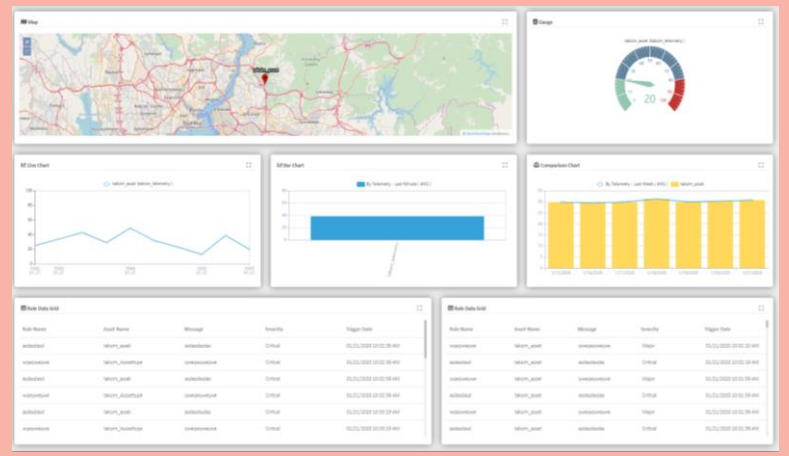
Define Dashboard and Widgets



Connect to Assets and Data



Deploy Dashboards



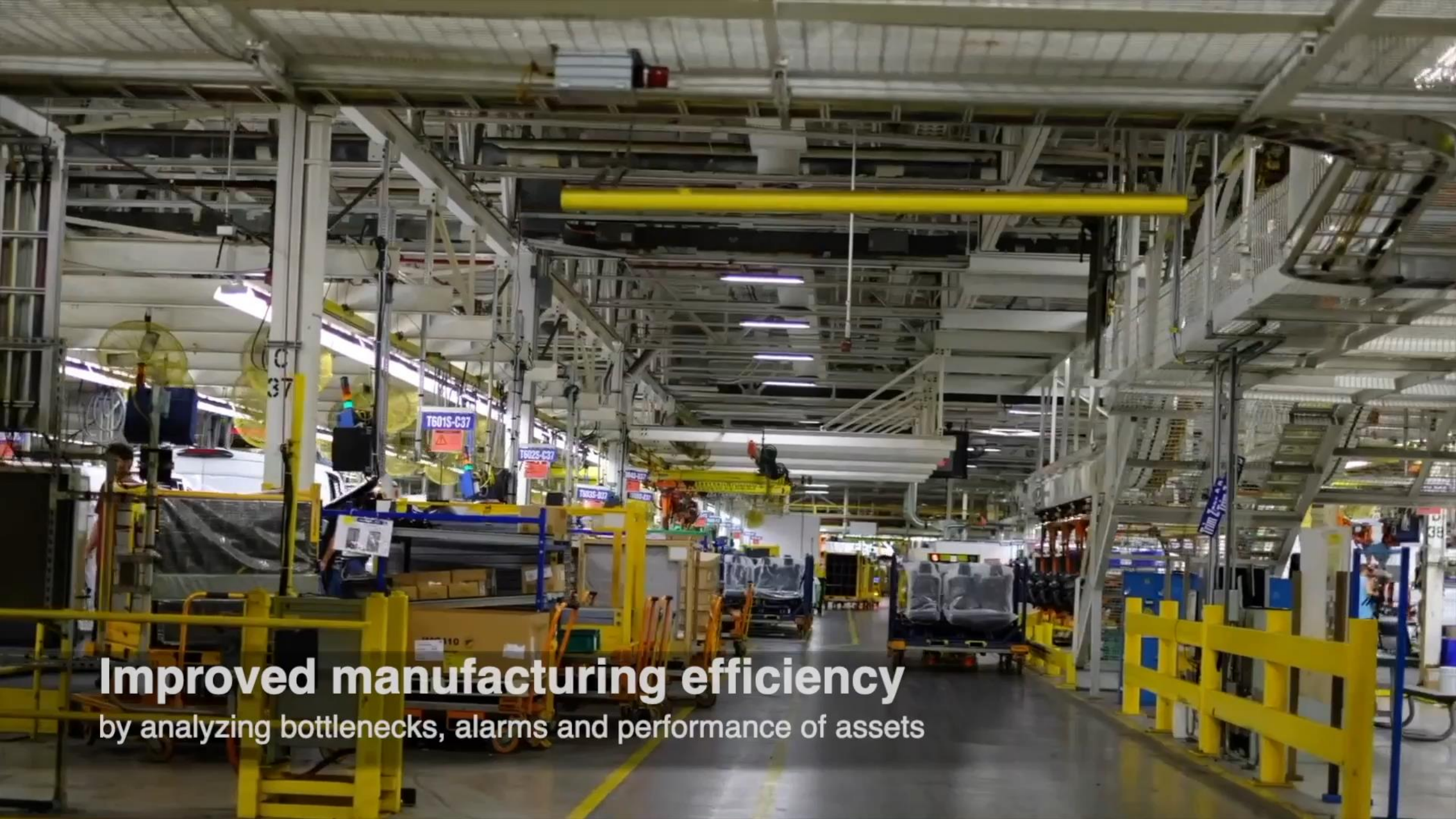
KoçDigital
With
BCG
The Boston Consulting Group

Platform360 Industrial IoT Solutions

USING MICROSOFT AZURE

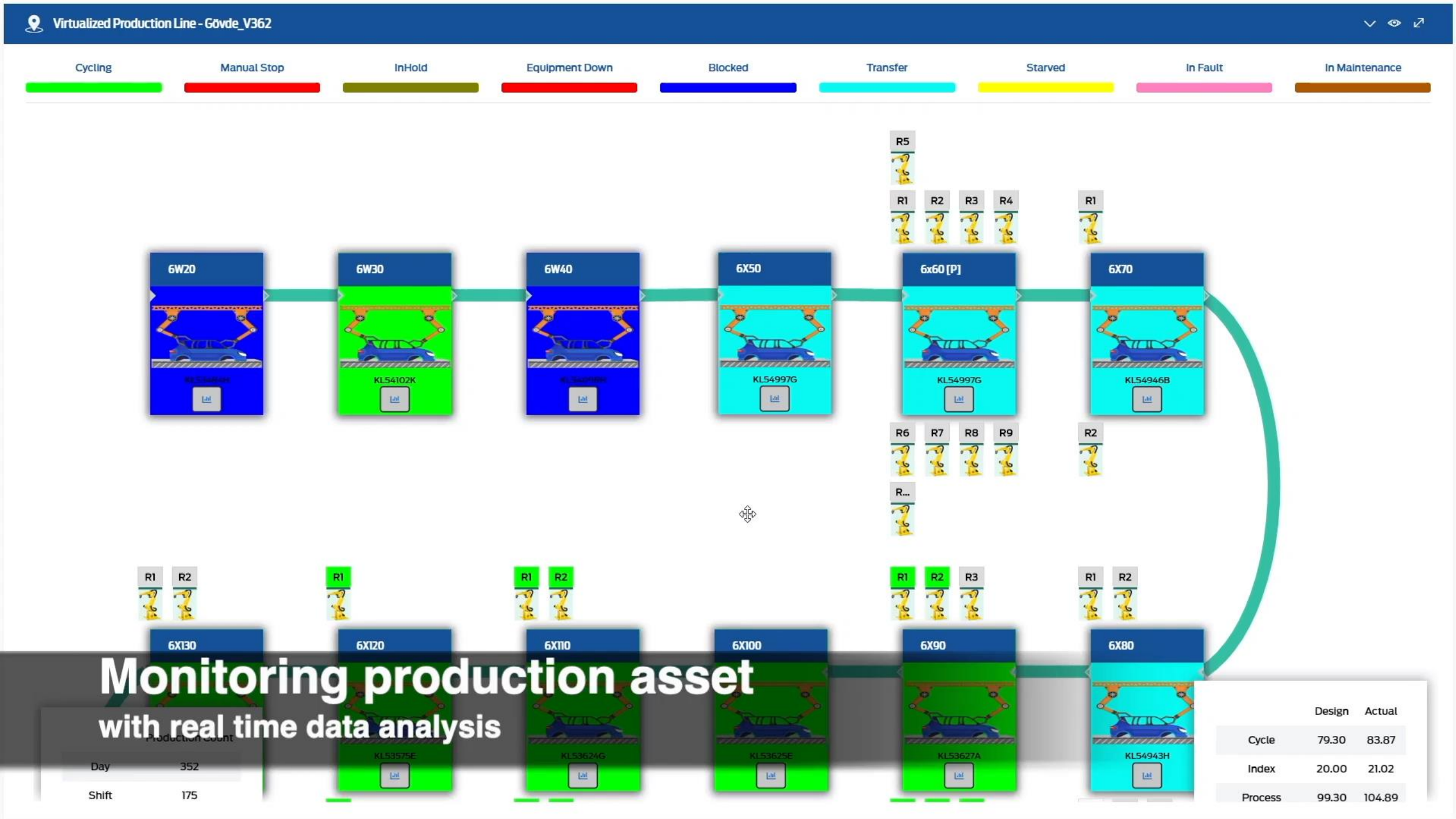
TABLE OF CONTENTS

Manufacturing Information System (MIS)



Improved manufacturing efficiency

by analyzing bottlenecks, alarms and performance of assets


Virtualized Production Line - Gövde_V362
Cycling
Manual Stop
InHold
Equipment Down
Blocked
Transfer
Starved
In Fault
In Maintenance
6W20
6W30
KL54102K
6W40
6X50
KL54997G
6x60 [P]
KL54997G
6X70
KL54946B
R5
R1
R2
R3
R4
R6
R7
R8
R9
R...
6X130
6X120
KL53575E
6X110
KL53624G
6X100
KL53625E
6X90
KL53627A
6X80
KL54943H
Monitoring production asset
with real time data analysis
Production Count
Day 352
Shift 175
Design Actual
Cycle 79.30 83.87
Index 20.00 21.02
Process 99.30 104.89

Tangible impact in decision making with actionable insights

- Asset Performance & Job Per Hour
- Manufacturing Asset Layout Management
- Rule Based Machine Monitoring
- Cycle Analysis
- Bottleneck Analysis
- Asset Downtime & Alarm Management
- Root Cause Analysis
- MTBF & MTTR Reporting
- Anomaly Detection

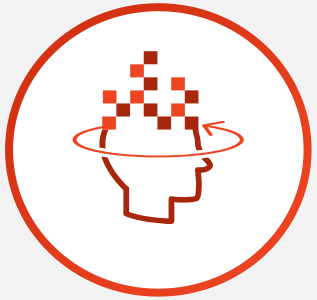
Productivity KPIs

Bottleneck Analysis

Maintenance Management

Manufacturing Information Systems Objectives

Aggregate & process sensor generated data into a unified platform



Unification of machine data to single semantic layer

Create a digital data platform for advanced manufacturing analytics

Up to **% 10**

Throughput increase with horizontal product line optimization

Up to **% 50**

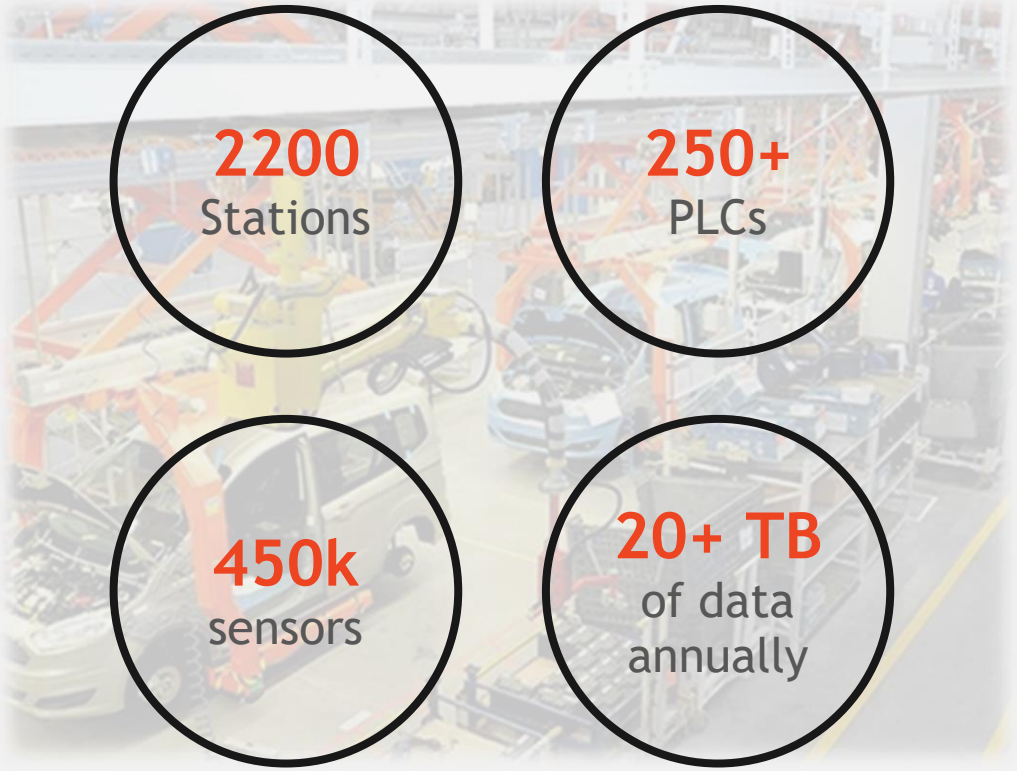
Increase in employee engagement with real-time monitoring and predictive maintenance

Large Automotive Manufacturer Customer Case

KoçDigital Client Example

Platform deployed across the whole factory

Press shop, welding, paint shop & assembly



Project Impact

At the first year of the project, KPIs reached

- Increased overall output without additional investment on capacity.
- Maintenance employee engagement increased.
- Paper-based data collection has been eliminated on KPI calculation and plant monitoring.
- Automated processes have increased employee productivity.

Source: KoçDigital

Track & Trace

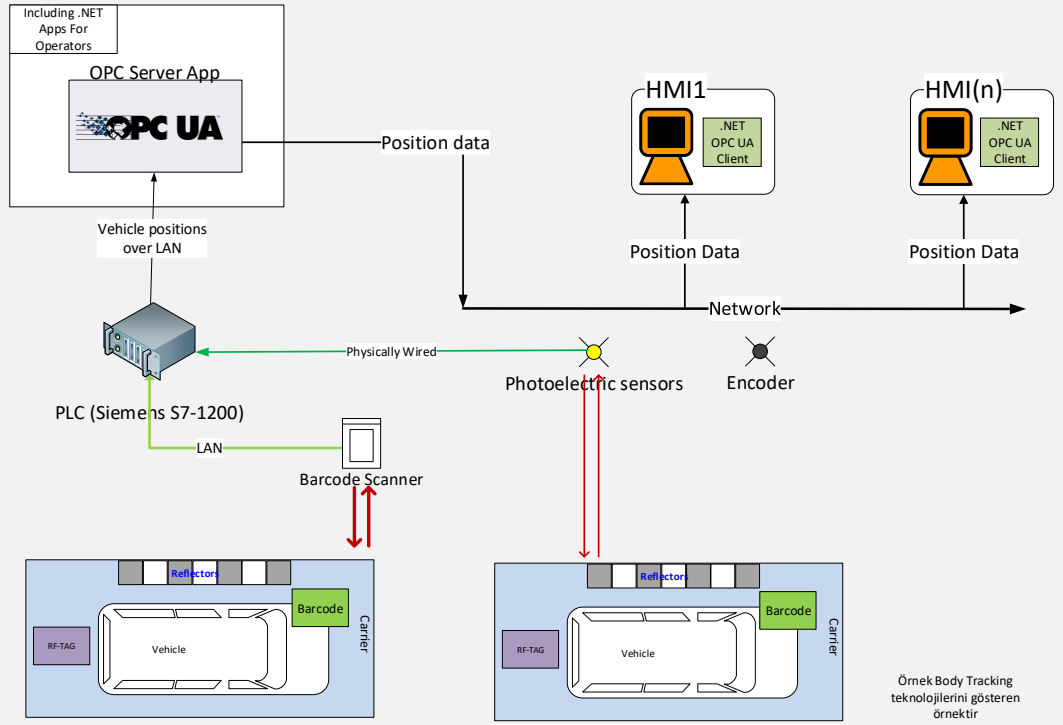
Product Traceability

Correct position of products are traced during manufacturing process

Case Example

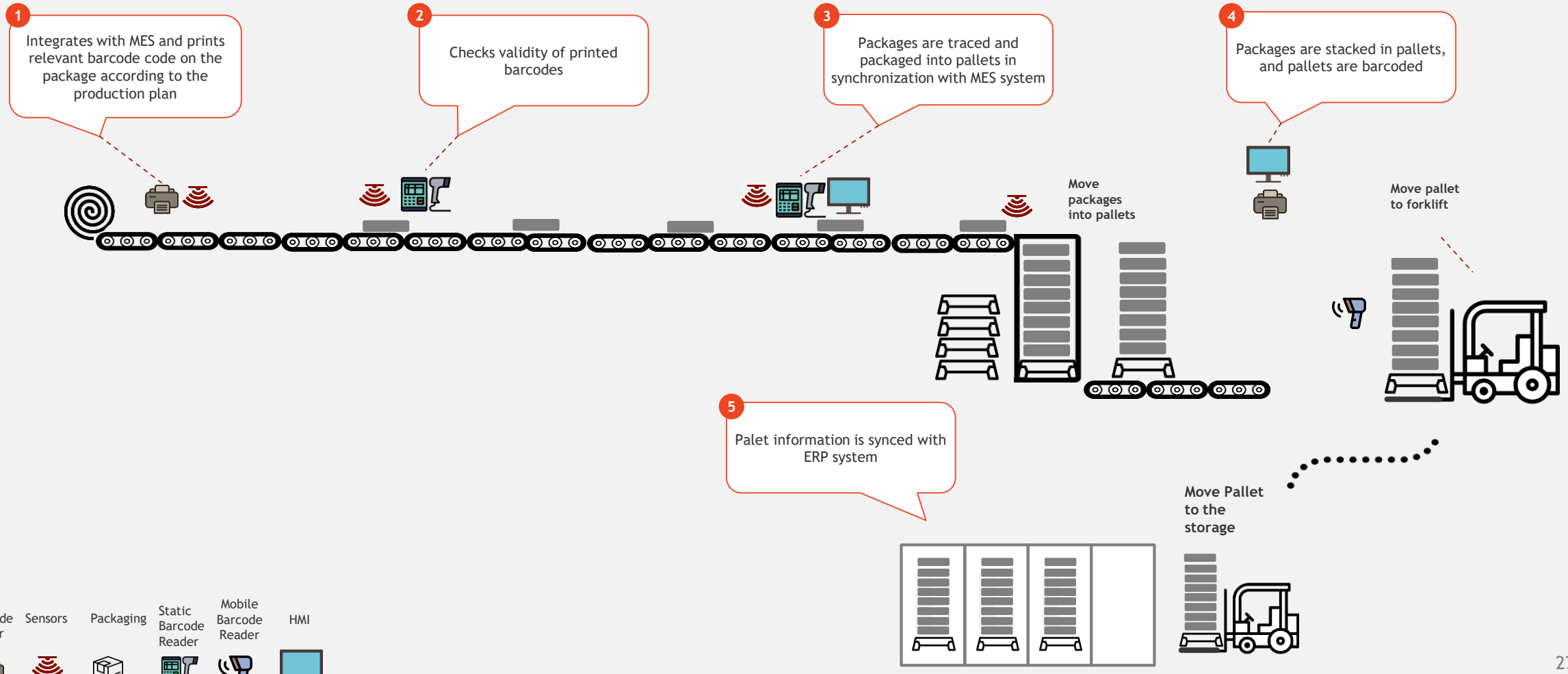
Support for variety of technologies

- RFID Tags
- Photoelectric Sensors
- Barcode Scanner
- OPC UA PLC Connectivity
- SCADA Integration



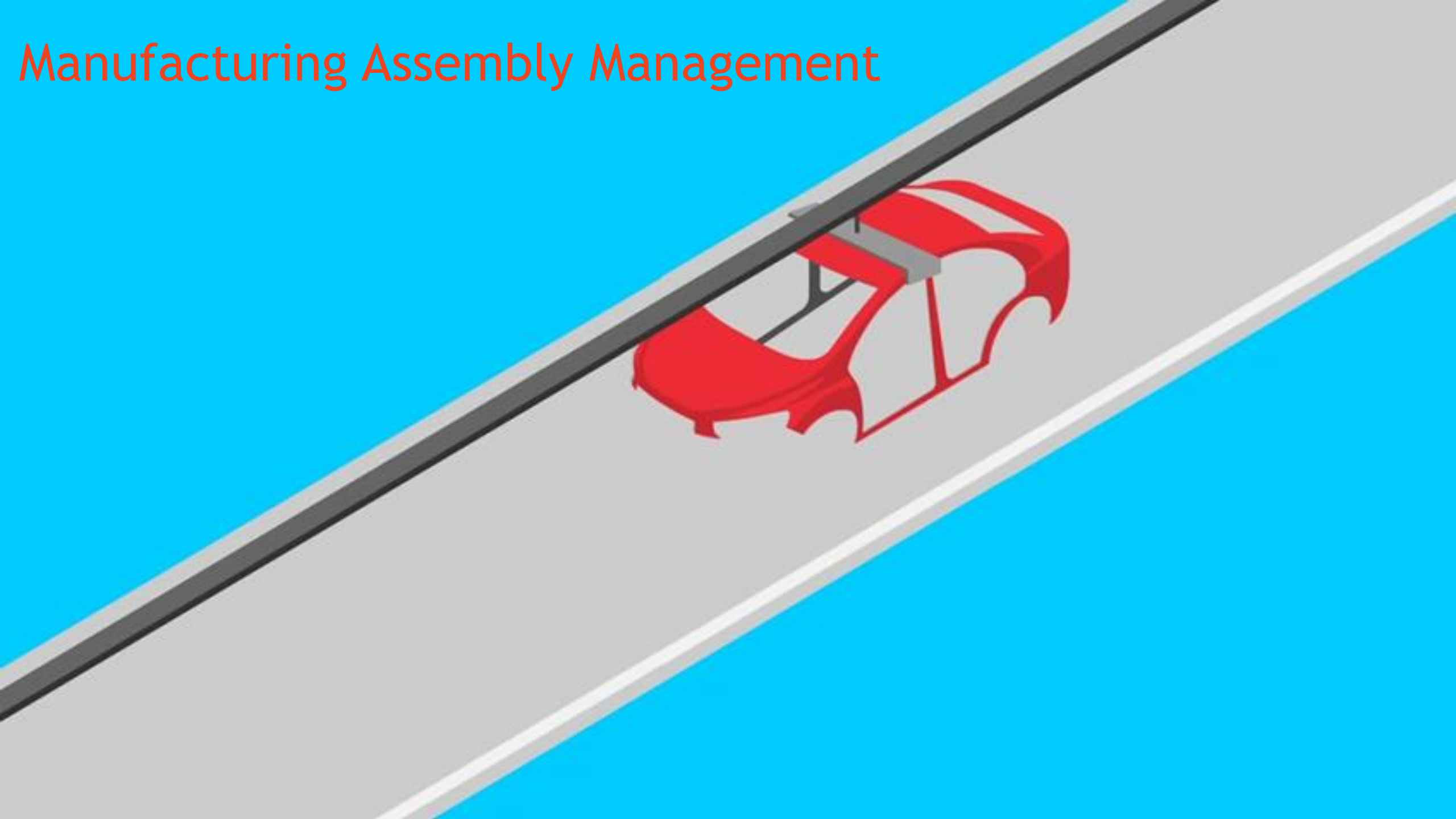
Track & Trace: Palletizing Process Example

Case Example



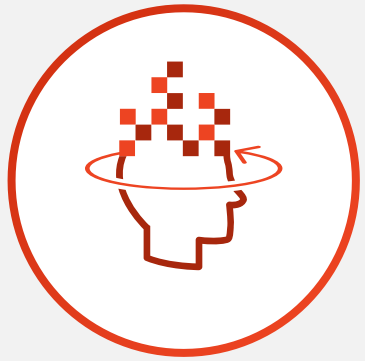
Assembly Management

Manufacturing Assembly Management



Assembly Management System (ASM) Objectives

Shop-floor integration with Manufacturing equipment and Product traceability



Human machine interfaces for worker guidance

Trace and enforce how and from which parts each end-product manufactured

Increased Manufacturing quality Through monitoring and enforcing quality guidelines

Decrease worker costs for Adapting to Manufacturing different product variants

Zero Defect

Targeted assembly process

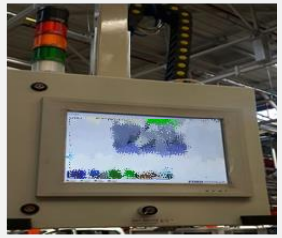
Shop Floor Connectivity

Collect Manufacturing Data from Assembly Equipment and Human Machine Intefaces

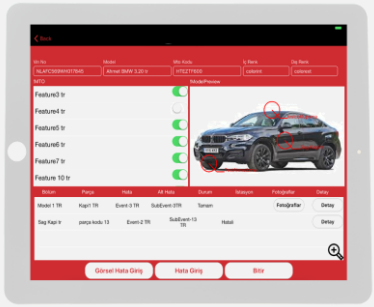
Human Machine Interfaces

Industrial Grade HMIs customized according to requirements

- Supports asynchronous operations
- Different installation methods according to shop floor layout
- Edge industrial data collection
- Visual and Audio Alarms



Different Screen Sizes



Tablets

Commercial or Industrial Tablets

- Shows status of manufacturing quality operations
- Allows digitized entry of defects to system by quality personnel

Assembly Equipment

Worker Guidance for Assembly Operations

Employees are driven to quality with visual guidance

- Guides worker through assembly process
- Monitors the procedure and parts of the assembly
- Can be integrated with assembly and quality tools such as electric wrench (Open Protocol support)
- Support with a-sync operation, network latencies doesn’t effect manufacturing process
- Can be integrated to customer Product Lifecycle Management Solution

Remote Asset Management (RAM)

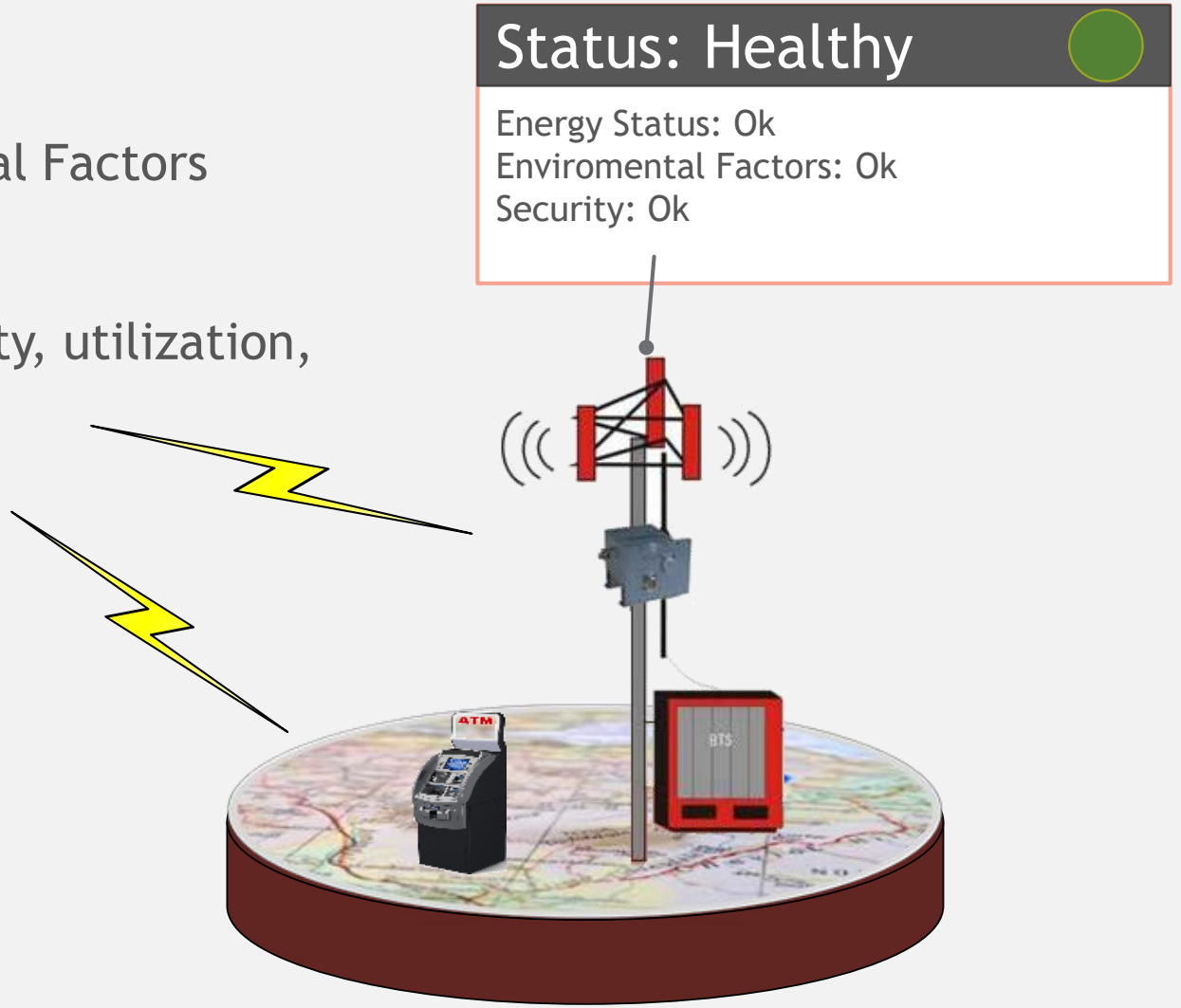
Remote Asset Monitoring

Observe: Status, Operation, Enviromental Factors

Manage: Data and workflows

Optimize: Historical data, asset reliability, utilization, usage and efficiency

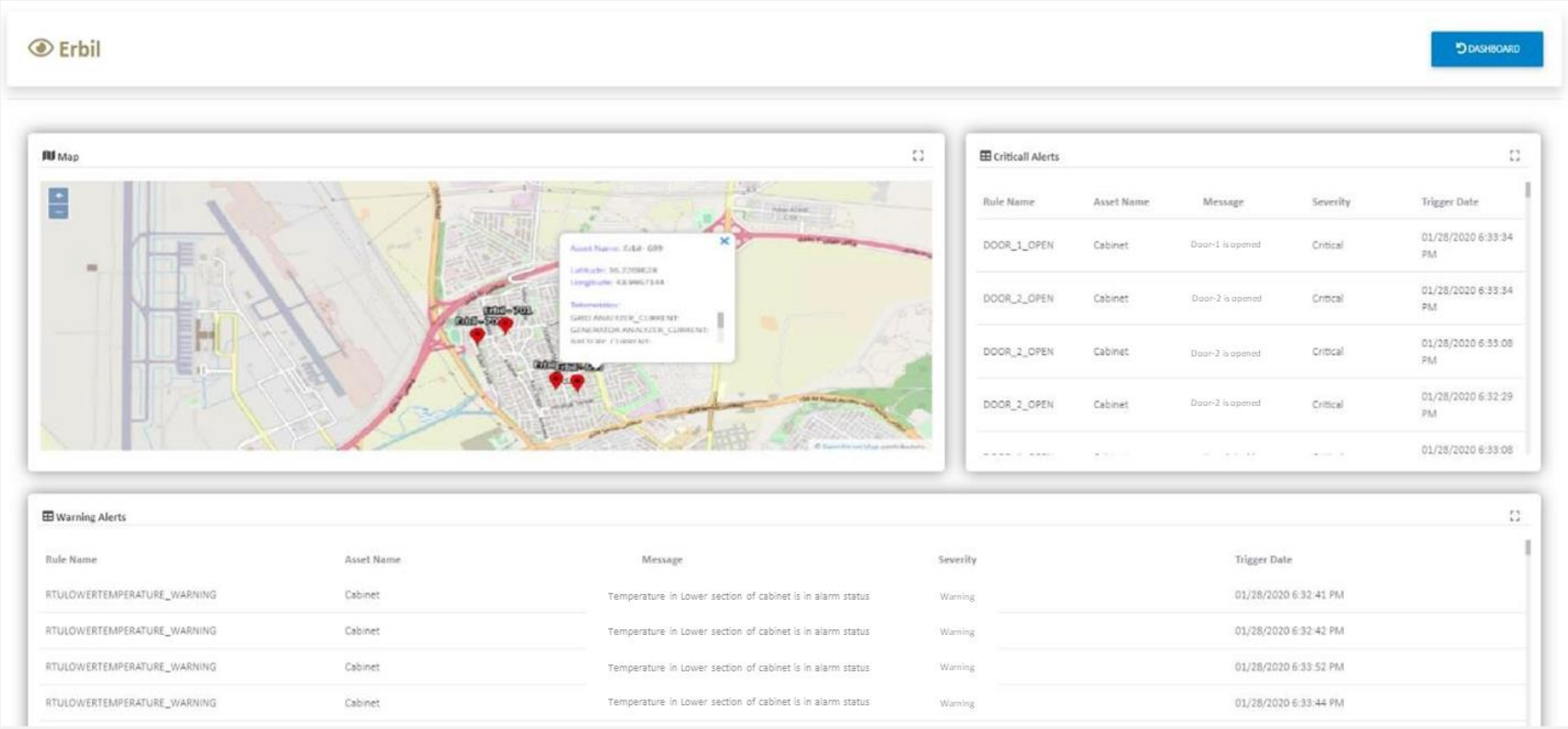
System Room	Cellular Tower	ATM
Enviroment	Infrastructure	...



Asset Monitoring Dashboard Example

Map with Asset Layout

- Asset data can be overlayed on map or sketches
- Assets in with different conditions are color coded. (Critical condition can be denoted as red etc.)
- Important asset attributes are accessible on Mouse hover
- Detailed asset information can be shown on a seperate dashboard
- System events/alarms can be shown in table format

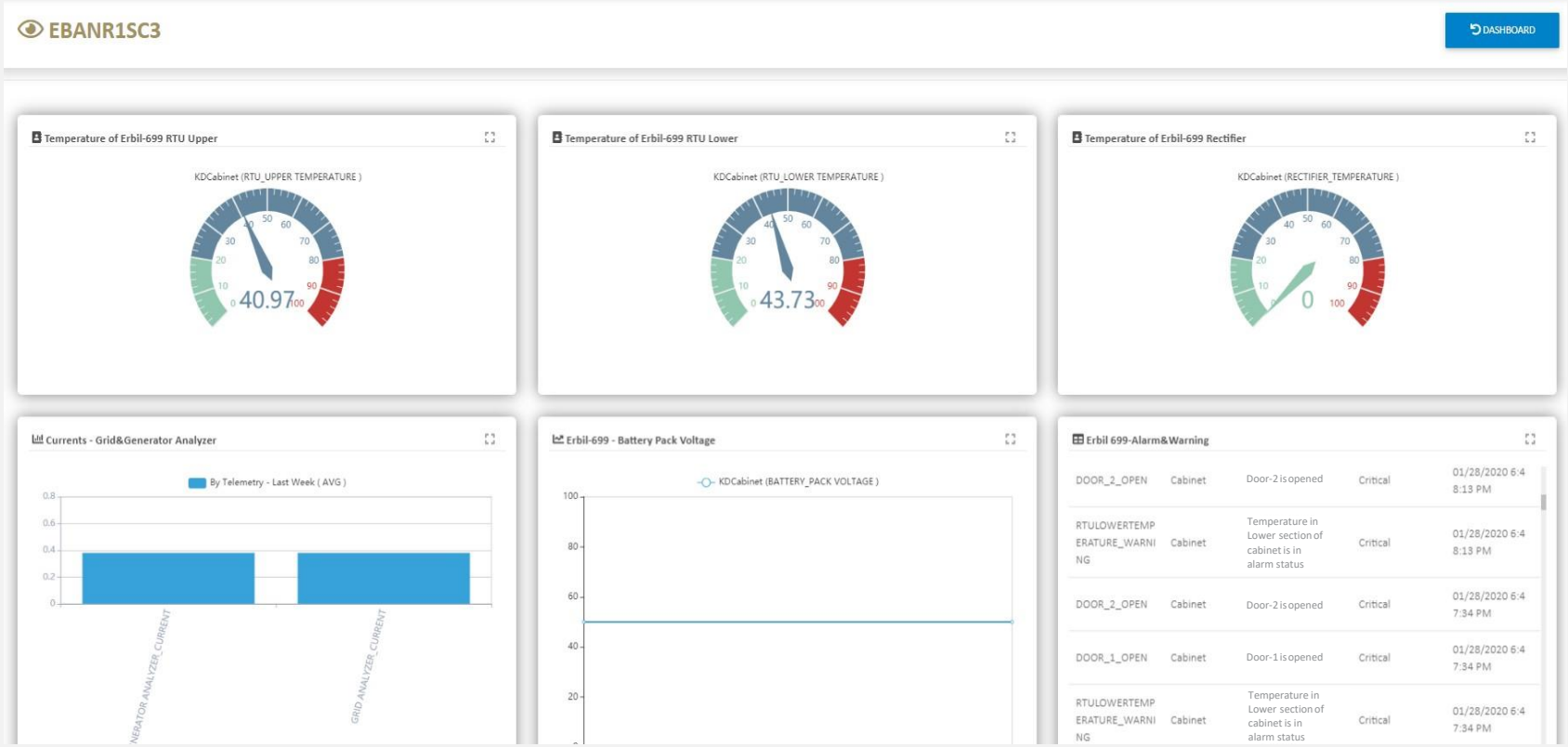


✓ Dashboard layouts are completely configurable using widgets

Detailed Asset Dashboard Example

Detailed Telemetry Data of Selected Asset

- Temperature gauges, Battery Pack Voltage graphs, Currents Grid and Generator Analyzer Graphs, and all other telemetries configured, can be displayed at detailed asset Dashboard.
- This is a configurable dashboard that can be expanded by adding new widgets for each telemetry that are expected to be seen on the page.
- All alarms and warnings can also be displayed here for the pole selected.



Telecom Operator – Remote Asset Management

Instantaneous Monitoring of CCTV Poles andAssets

Assuring the stations health by monitoring sensor data collected by P360 RAM platform

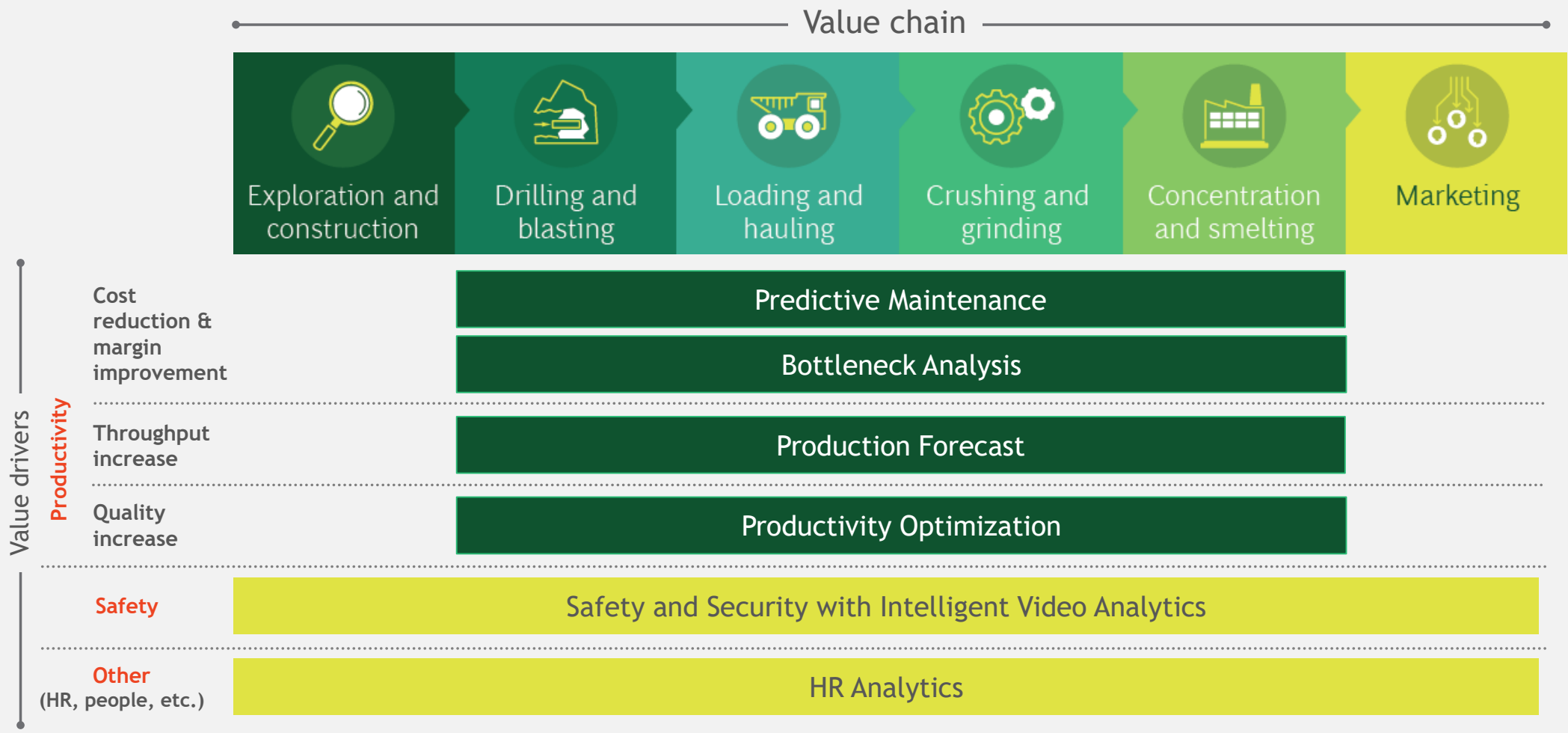
1400
CCTV Poles

500
Sensors per pole

- Aims to monitor 1400 CCTV poles setup located in multiple cities
- Monitoring each pole on a map design to see instant condition
- Poles assets health by collecting sensor data such as;
  - Cameras condition
  - DC power supply status
  - Air Condition of all cabinet assets
  - Security of the cabinet by checking sensors on
  - cabinet doors
- User friendly, configurable dashboard and rule management mechanism for configuration and reporting

Manufacturing Analytics

KoçDigital advanced analytics and IOT solutions in core mining



Source: BCG case experience

Ongoing | Implemented

Manufacturing Analytics Customer Case in Mining

Client Situation

- Large mining company with numerous distributed mining fields wants to increase operational efficiency using IoT and analytics

Results

- Operational IoT and IT systems unified in single datalake
- Analytical use cases improved business processes

%21 decrease in downtime duration

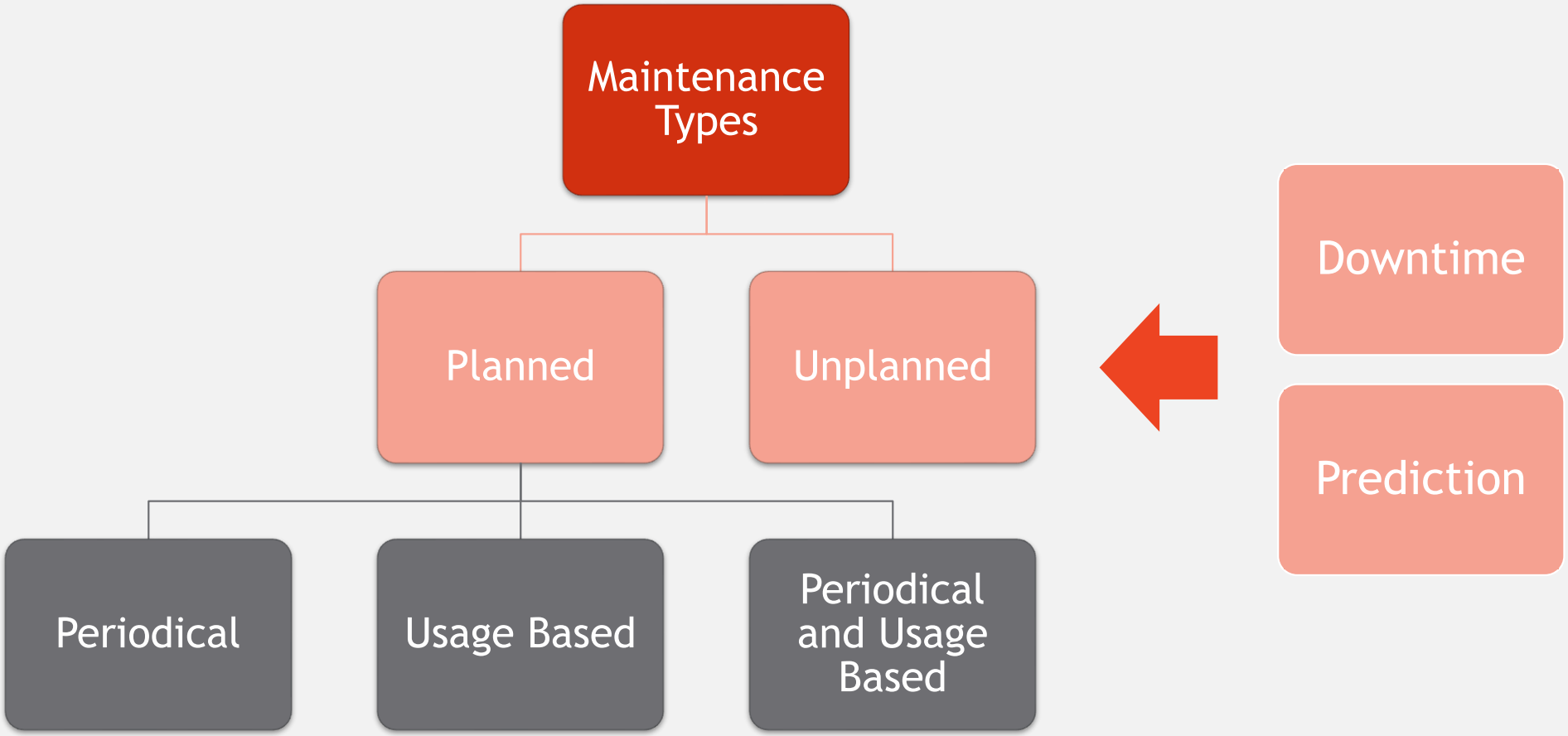
1.2M annual operational efficiency in just 3 mines

%8 less energy usage

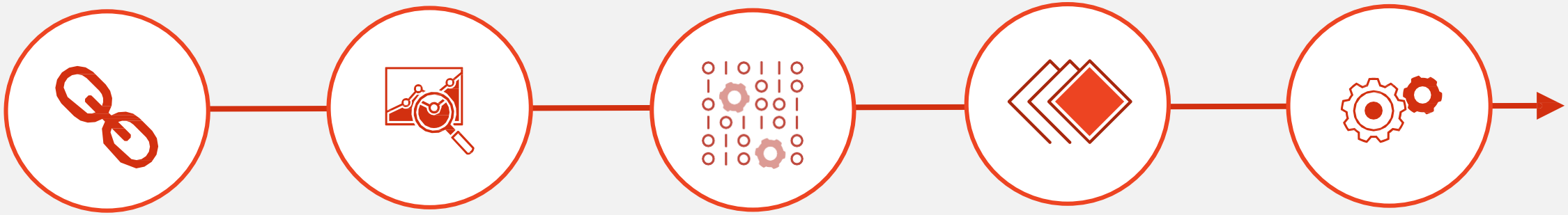
%17 less usage of additive material

Planned/ Predictive Maintenance

Maintenance Workflows



Platform360 Maintenance Flow



Gather Data

- Real-time data collection with IoT
- Integrate with operational systems for context

Real-time Condition Monitoring

- Asset monitoring & management
- Evaluate alarm data using context

Maintenance Management

- Planned Maintenance management
- Downtime management

Enrich with Predictive Models

- Use asset sensor data and work history to predict asset health and future failures
- Enrich with user defined rules

Optimize

- Continuous model improvement through feedback loops

Predictive maintenance reduce surprises and cost while increasing equipment uptime

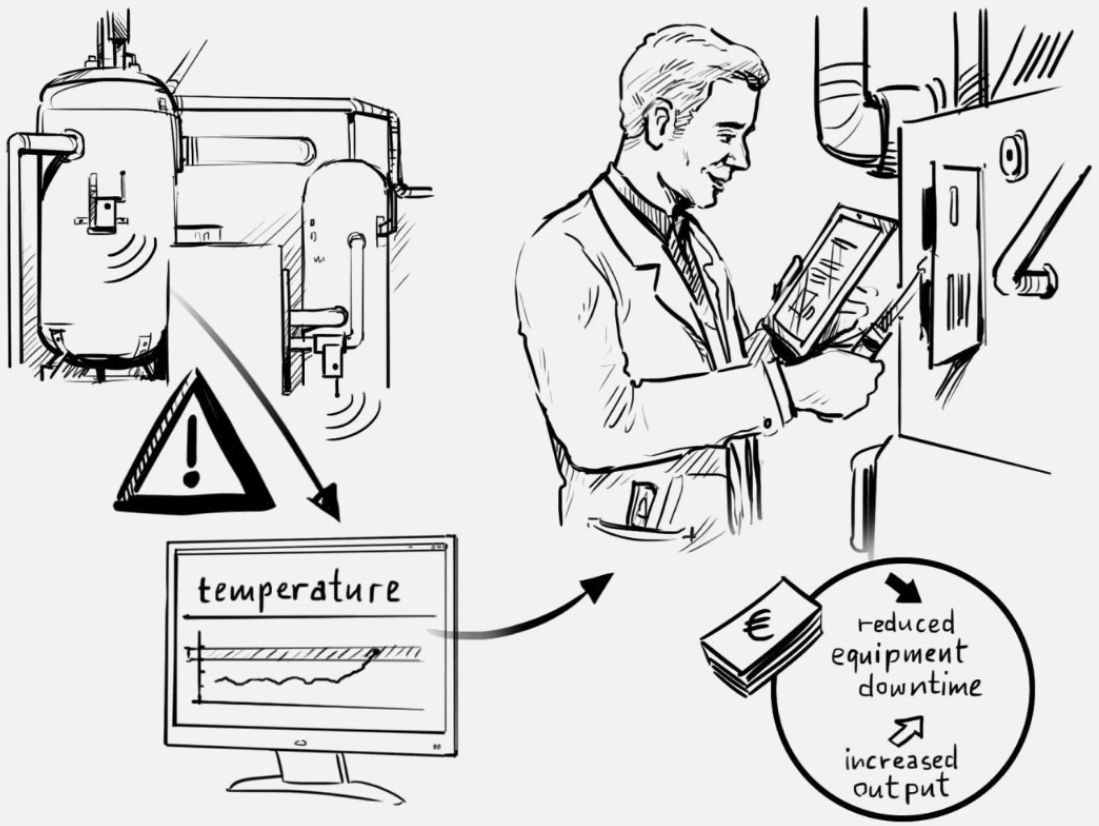
50-70%
reduction of unplanned downtime

10-20%
increase in equipment uptime

10-30%
reduced overall maintenance costs

Source: KoçDigital, BCG, Deloitte, Mckinsey

Predictive Maintenance Solution



VISION

- Minimize unplanned downtimes and improve asset availability
- Doing the most efficient preventive maintenance
- Minimize mean time between failures (MTBF)
- Autonomous control of equipment condition
- Completely paperless maintenance activities

VALUE SOURCE

- Reduced equipment downtime at core machinery
- Improve first-time-fix-rate (FTFR) and reduce mean-time-to-repair
- Reduce cost of maintenance without sacrificing reliability

Source: BCG case experience

Energy Management

Efficiency Improvement

What to Expect from Energy Monitoring?

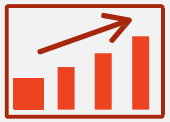
Facility Manager

Manufacturing Area Manager

Industry 4.0 Transformation Manager

How much energy do we consume?

- What is my manufacturing area/line or even product based energy consumption?
- What is my real cost for manufacturing?
- How can I react to energy spending fluctuations?



Trends of Energy Usage

- Is my energy usage better or worse than before?
- What are my trends in energy consumption that reflect seasonal, weekly, and other operating patterns?

Waste & Problems

- Where are the specific areas of wasted energy?
- Is there anomalies in energy consumption?
- How can I make warning signs visible to maintenance staff?

Analytics

- How much energy will I consume next month?
- How can I correlate this data with other connected factory data?

KoçDigital With BCG The Boston Consulting Group

Industry leaders follow a holistic IoT platform based approach in energy management

1 Collect energy information from variety of systems

Energy Meter

Energy Analyzer

Remote Assets

EV Charging Station*

2 Real-time data processing to detect events and alarms

- User defined rules to be enforce known business rules
- Analytical models can be deployed on the system to detect advanced data correlations

3 Self service dashboards for visualization

- Create user/role specific dashboards and widgets for customizable usability

4 Common service layer, enabling numerous IoT analytics & applications

- Cross-functional data ingestion
- Clear process & APIs for data dissemination
- Horizontal information flow

5 Advanced analytics to predict and prescribe

- Analytical products for Industry standard gains
- Predictive statistics tailored to specific needs

Manufacturing Execution System

Manufacturing Company Example

Shop Floor Status

Mix of legacy machines and new machines from various vendors

Variety of sensors communicating in different protocols

Diverse family of products manufactured by same manufacturing assets

More than one manufacturing plant but no single view of manufacturing

Governance

IT generally not involved in acquisition of OT systems.

OT software acquisitions were driven by operational needs

Data connectivity is not an issue to be considered in new asset acquisitions

OT management software vision was focused on asset KPIs such as OEE (Overall Equipment effectiveness)

Decisions are not driven by data

Targets of Industrial IoT

- Increased manufacturing throughput
- Decreased unplanned downtimes
- Traceable and improved manufacturing quality
- Data driven decision making by convergence of IT & OT

Personas in Manufacturing

Manufacturing Manager

What is happening in manufacturing in real-time?

How can I minimize unplanned downtimes?

How does my manufacturing line efficiency change per product type?

Where are my manufacturing bottlenecks?

How can I increase quality of products?

How to optimize energy spending?

IT & Digital Transformation Manager

How can I add an IT capabilities in OT systems?

Can I create a backbone for all my industrial systems?

Can I build-up on the system without vendor lock-in?

How can I become a data-driven company?

Can I create a single view for all my manufacturing areas/plants?

How can I create a secure infrastructure?

KoçDigital With BCG The Boston Consulting Group

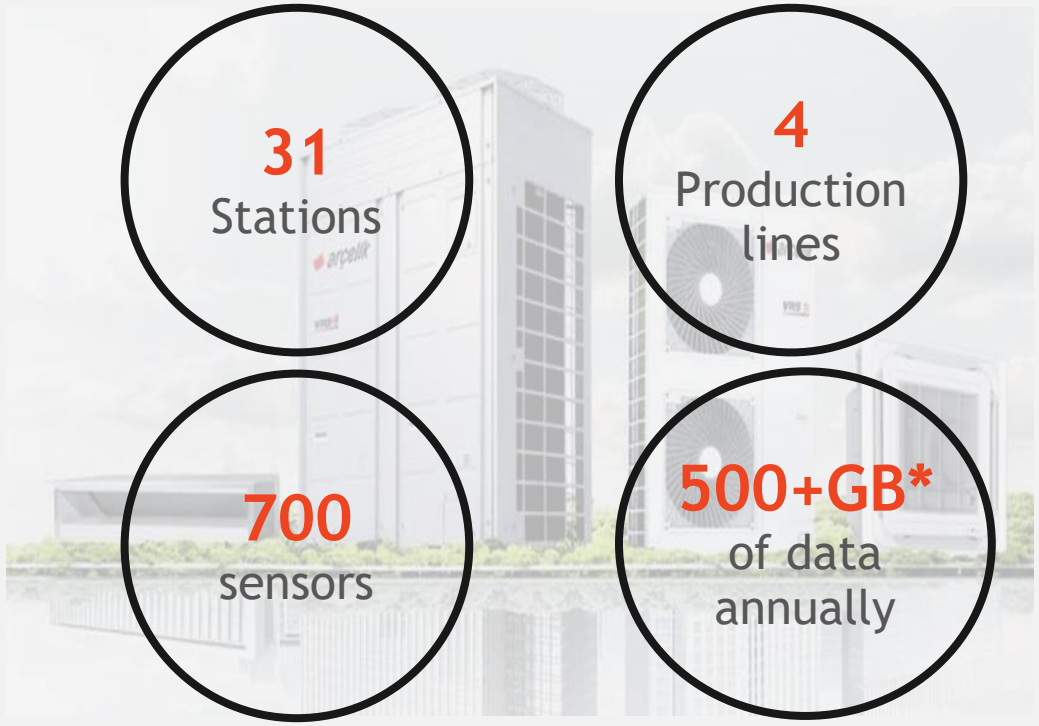
Manufacturing Execution on Internet of Things Modules

IoT Platform	Data Collection	Tracking	Plant KPIs	Maintenance	Operational Intelligence	Quality Monitoring
• Manufacturing Backbone • Operational Data Store • Rule Engine • Common API Layer	• Shop Floor Connectivity • Energy Monitoring • PLC • SCADA • MQTT	• Track Items inside manufacturing process • Track workers • Track Equipment • RFID read/Write • Barcode reader • Labels printing	• OEE • Job Per Hour • Bottleneck analysis • Cycle Analysis • Plant Performance • Station Performance per product type	• Asset Downtime, MTTR, MTBF monitoring • Anomaly Detection • Root Cause Analysis • Predictive Maintenance	• Self service dashboard • Digital Twin of the Plant	• Quality Inspection • Video Analytics based quality inspection

Procedural enforcement	Planning& Scheduling	Manufacturing Process Management	Resource Management	Dispatching	Production Management	Integration
•Manufacturing process steps are performed; •in the correct order •At the right time •By the correct resource •In conformance with quality req.	•Production Planning •Shift Management •Batch production execution •Components picking list	•BOM Recipe •Process Planning /Work instructions	•Equipment •Materials	•Dispatch work acc. To source avail. Schedul. nd capacity	•Process to order management	•ERP Integration •PLM Integration •Supplier /Customer system integration

Manufacturing Execution System Customer Case

Platform360 deployed to an Air Conditioner Plant as manufacturing execution system



Project Impact

Eliminate quality errors in manufacturing

- *MES including operational data store, equipment tracking and plant performance.*
- *Model & critical part matching process for 12 production points*
- *Station based production, fault, downtime & anomaly detection reports*

Source: KoçDigital

KoçDigital
With BCG
The Boston Consulting Group

Platform360 Industrial IoT Solutions

USING MICROSOFT AZURE

TABLE OF CONTENTS

KoçDigital is a Digital Center of Excellence, combining strengths of BCG and Koç Holding & KoçSistem

BCG

- DIGITALBCG / BCG GAMMA — World class capabilities in analytics
- >3,000 — Access to >3,000 digital experts
- State-of-the-art enablement

KoçDigital With BCG The Boston Consulting Group

KoçSistem

- Digital capabilities and infrastructure
- Very strong implementation capabilities
- Trusted Koç brand — Koç

- Advanced Analytics
- IoT Solutions
- Data Platform Design & Development
- KoçDigital Academy

Source: KoçDigital

We already have 100+ staff in KoçDigital, supported by 850+ Gamma and 1500+ KoçSistem professionals

100+
Data analytics & IoT professionals

+

850+
Data scientists and engineers of BCG GAMMA

+

1500+
System Integration& Managed Services& Business Applications


KoçDigital
With
BCG
The Boston Consulting Group