COMAU
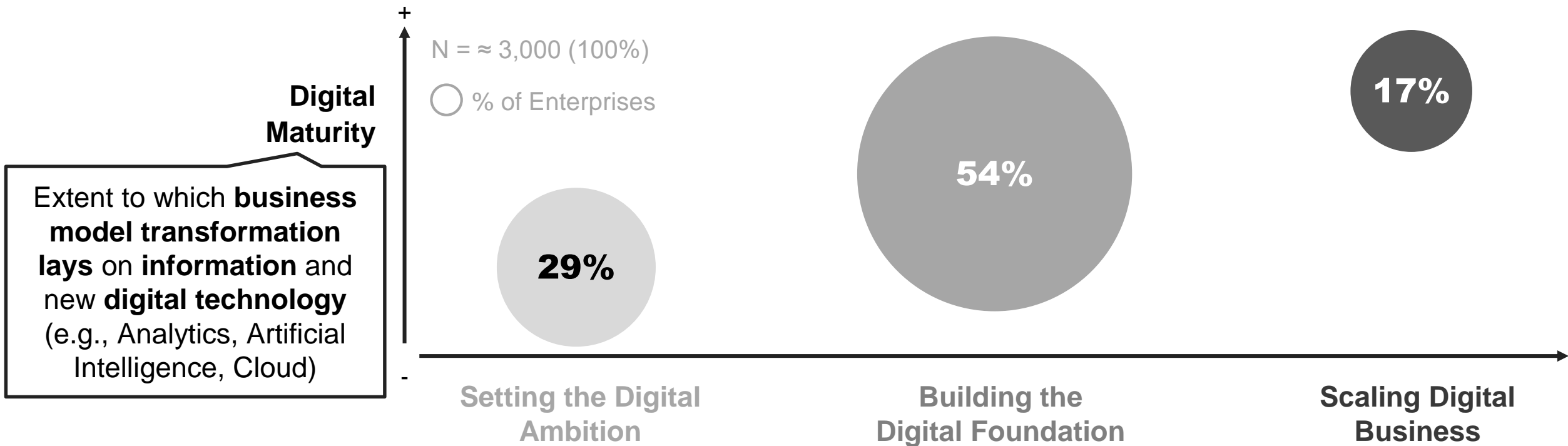
in.Grid:
Modular Platform
Overview

Andrea Ivaldi

Digital Business is Maturing
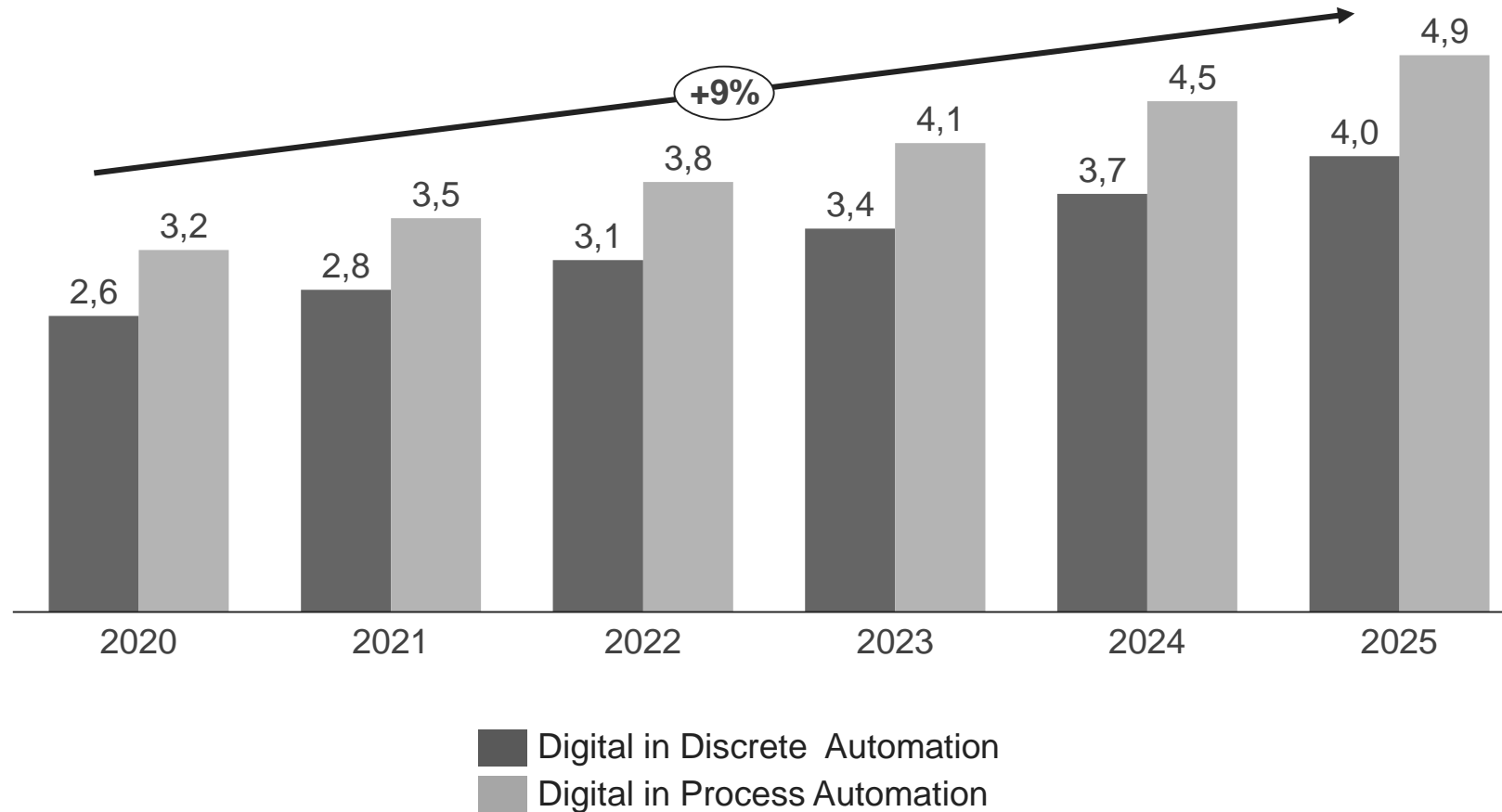
Distribution of Enterprises Digital Maturity

Digital Maturity

+

N = ≈ 3,000 (100%)

◯ % of Enterprises

> Extent to which **business model transformation lays** on **information** and new **digital technology** (e.g., Analytics, Artificial Intelligence, Cloud)

29%

54%

17%

-

Setting the Digital Ambition

Building the Digital Foundation

Scaling Digital Business

SOURCE: Gartner, Securing a New Foundation for Digital Business, 2019

Digital Market Overview
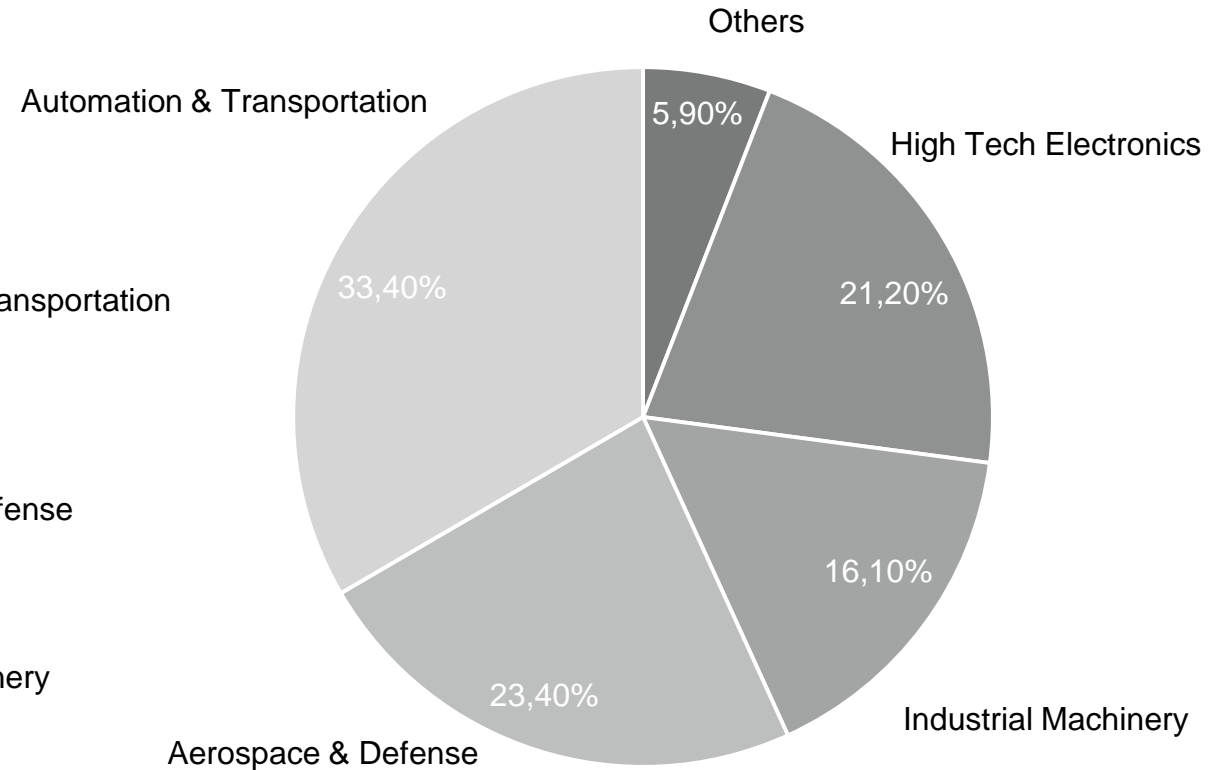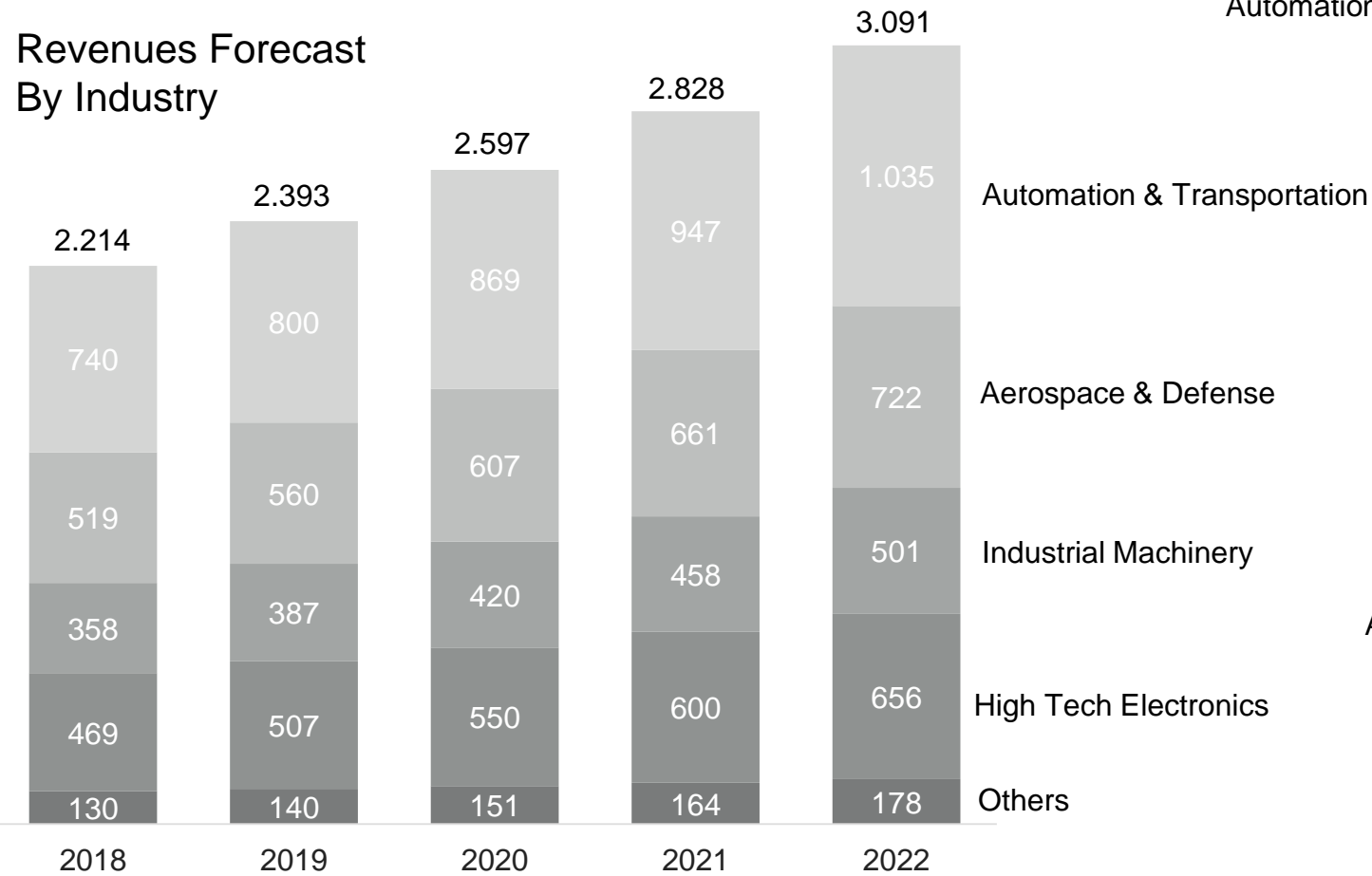## Discrete & Process Automation Industries (in B€)

+9%

Year	Digital in Discrete Automation	Digital in Process Automation
2020	2,6	3,2
2021	2,8	3,5
2022	3,1	3,8
2023	3,4	4,1
2024	3,7	4,5
2025	4,0	4,9

■ Digital in Discrete Automation
■ Digital in Process Automation

Source:
F&S, 2019 - Digital Manufacturing in Discrete Industries
Credit Suisse, 2018 – Global Industrial Automation
Not available for Years 2023-2025

Digital Market Overview
Revenues Breakdown of Discrete Industries by End Users (in M€)


Revenues Forecast
By Industry

Year	Automation & Transportation	Aerospace & Defense	Industrial Machinery	High Tech Electronics	Others	Total
2018	740	519	358	469	130	2.214
2019	800	560	387	507	140	2.393
2020	869	607	420	550	151	2.597
2021	947	661	458	600	164	2.828
2022	1.035	722	501	656	178	3.091

Source: F&S, 2019 - Digital Manufacturing in Discrete Industries
Not available for years 2023-2025

Pie chart (2022):
- Others: 5,90%
- High Tech Electronics: 21,20%
- Industrial Machinery: 16,10%
- Aerospace & Defense: 23,40%
- Automation & Transportation: 33,40%

Automotive and transportation is set to experience the highest growth during the forecast period (2022)

Digital Market Overview
Market Share in Discrete Manufacturing Industries

Dassault Systems — 18%

Siemens — 13%

PTC — 9%

Autodesk — 5%

Others — 55%
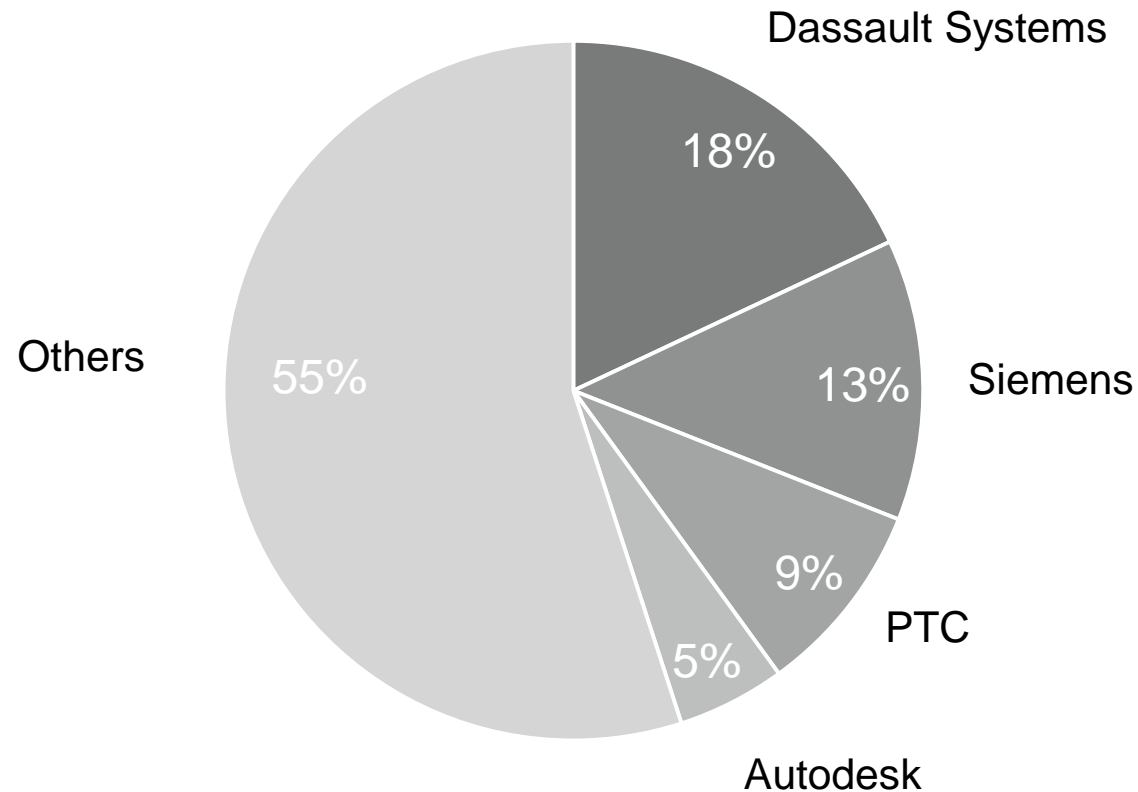
Leading companies are able to maintain market leadership with continuous technological innovations, product portfolio enhancement, and widening application coverage.

Digital Investments: (i.e.)
- **PTC**
80 M€ ~ (R&D 18% of total revenues)
- **Autodesk**
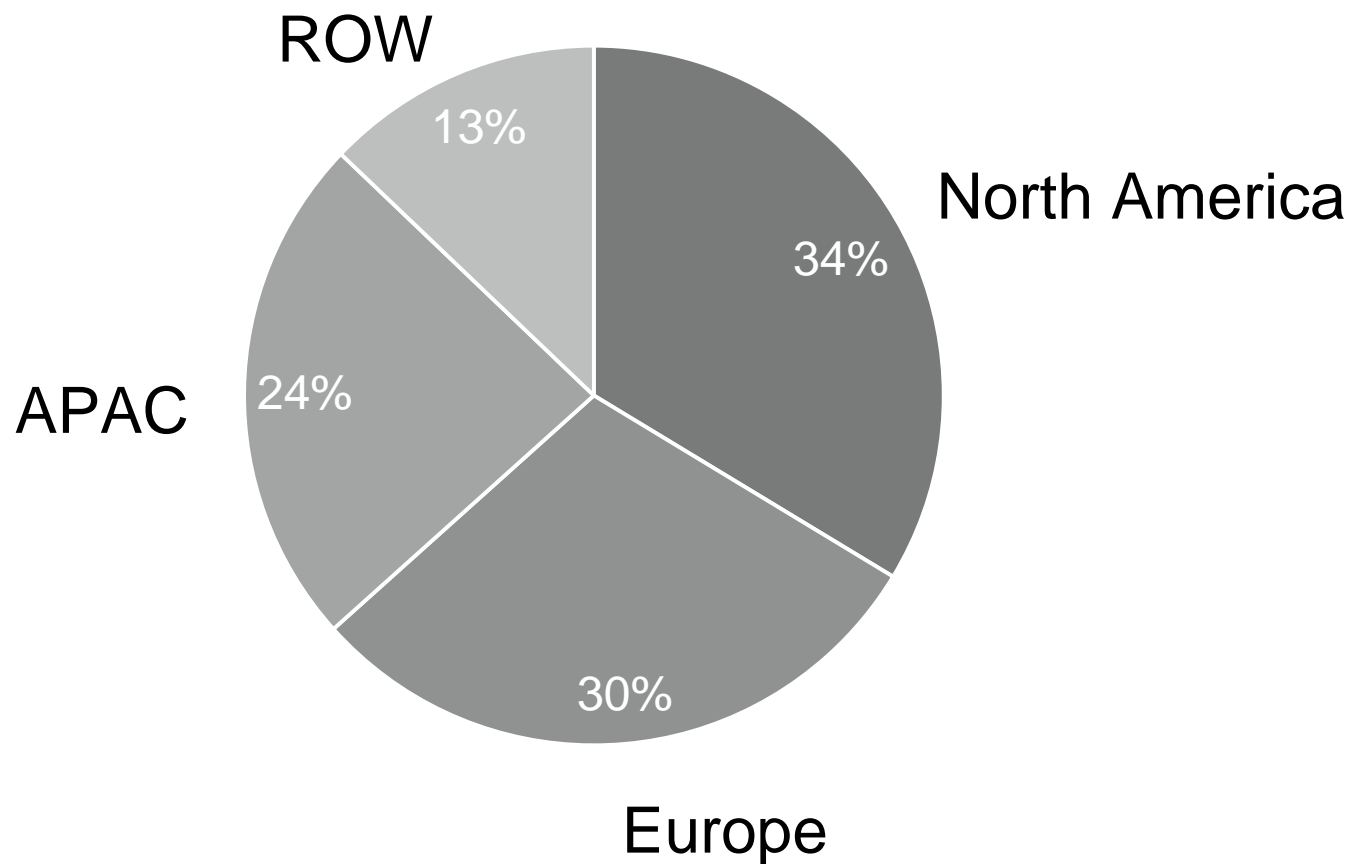70 M€ ~ (R&D 25% of total revenues)

Growing competitors (from 3% to …)
AWS, Bosch, Cisco, SAP, Google, Microsoft, Oracle, Software AG, GE Predix, Hitachi

Source: F&S, 2019 - Digital Manufacturing in Discrete Industries

Digital Market Overview
Revenues of Discrete Industries by Region

Revenues (2,2 B€) are equally divided among APAC, Europe and North America.

Nevertheless APAC has an high growth potentiality thanks to the growing Chinese demand.

LATAM demand is mainly located in Automotive, Oil & Gas, Chemicals industries and related maintenance activities.

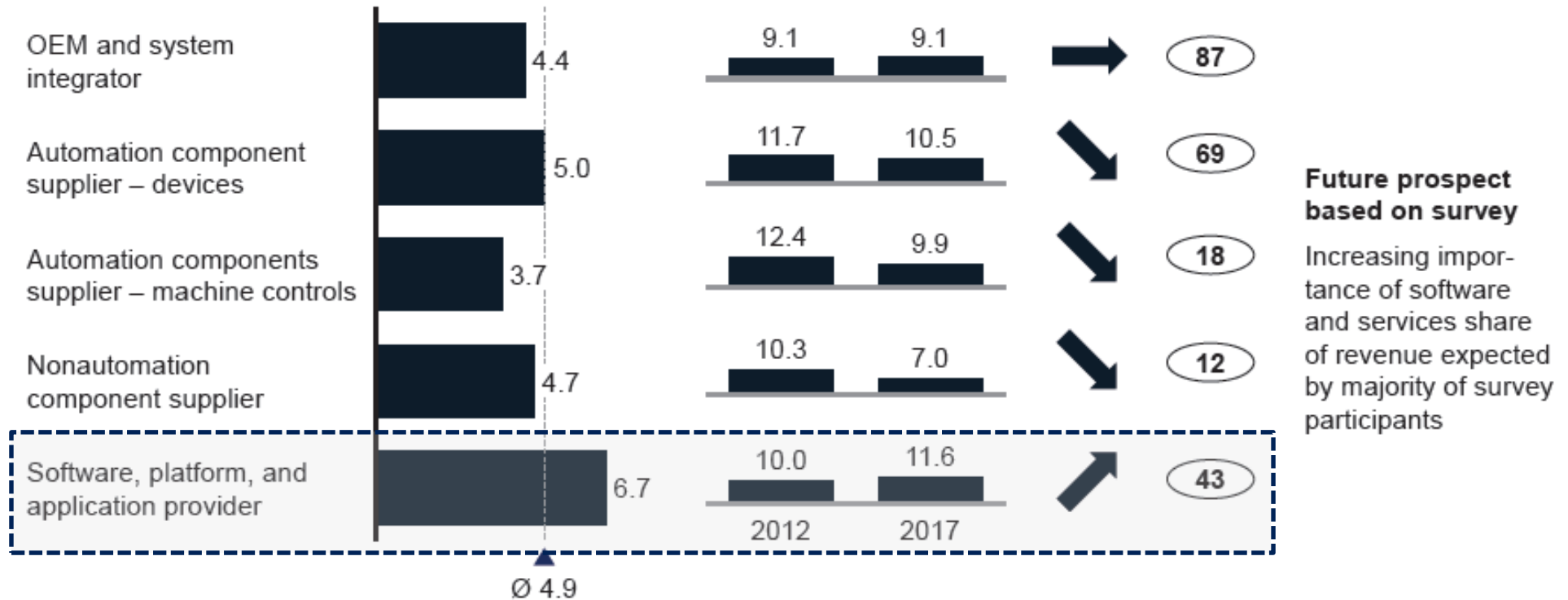*Source: F&S, 2019 - Digital Manufacturing in Discrete Industries*

Digital Market Trends

CAGR of revenue (2012 - 17)
Percent

EBIT margin development (2012 - 17)
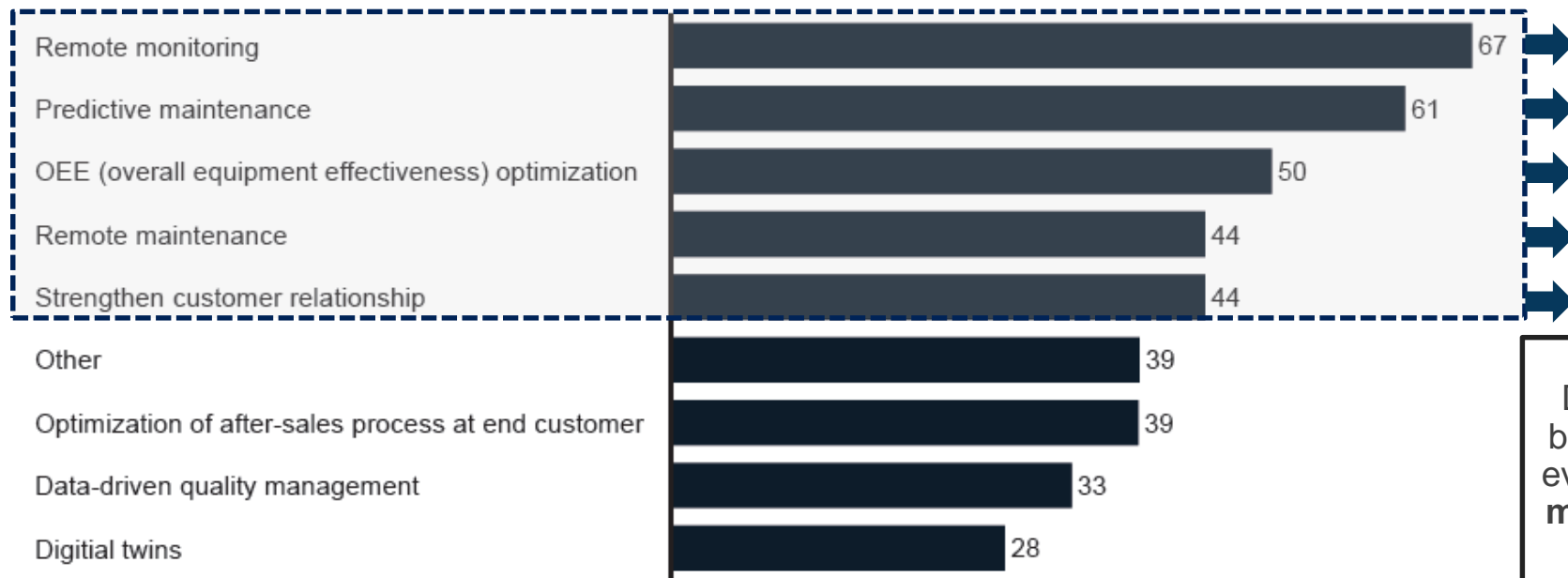Percent

(X) No. of companies for analysis[1]

➡ Change

Category	CAGR	2012	2017	Change	No.
OEM and system integrator	4.4	9.1	9.1	➡	87
Automation component supplier – devices	5.0	11.7	10.5	↘	69
Automation components supplier – machine controls	3.7	12.4	9.9	↘	18
Nonautomation component supplier	4.7	10.3	7.0	↘	12
Software, platform, and application provider	6.7	10.0	11.6	↗	43

2012   2017

Ø 4.9

Future prospect based on survey

Increasing importance of software and services share of revenue expected by majority of survey participants

Source: McKinsey -2018 – research, CapitalIQ

Digital market trends
Most Important Use Cases (%)

Remote monitoring	67
Predictive maintenance	61
OEE (overall equipment effectiveness) optimization	50
Remote maintenance	44
Strengthen customer relationship	44
Other	39
Optimization of after-sales process at end customer	39
Data-driven quality management	33
Digitial twins	28

Comau Focus

Digital enables a wide array of solutions, but its particular relevance to customers is evidenced by just a few use cases: **remote monitoring, predictive maintenance** and **OEE optimization.**

These are the applications considered "most important" by at least half of the sector experts that McKinsey surveyed and the ones driving the growth trajectory in software- and service-related revenues in the machinery and industrial automation sector

Source: McKinsey -2018 - Machinery & Industrial Automation survey

Digital Transformation

The **world of manufacturing is changing** and so are its market drivers

Evolution requires transforming the status quo into different production paradigms, and overall **personalized production**

Processes must become increasingly **reconfigurable, flexible**, **scalable and promptly reactive**

Digitalization is the fundamental enabler of these new manufacturing paradigms

Benefits to customer

3-5%
Productivity increase

20-35%
Reduction in machine downtime

12-20%
Inventory reduction

30-50%
Increase in productivity (i.e. production planning)

5-12%
Cost of poor quality reduction

80%
Forecasting accuracy improvement – up to

15-25%
Reduction in time to market

15-25%
Reduction in plant maintenance costs

SOURCE: According to the most accredited studies

Why Comau?

MANUFACTURING BACKGROUND:
We understand automation challenges (**flexibility**, **uptime** maximization, **reconfiguration**).

PROCESS ASSESSMENT CAPABILITIES:
We know **industrial processes**, **user centered design** principles and We always **listen** to Our **customer**.

ENGINEERING & PRODUCT MANAGEMENT BACKGROUND:
We have long term **competencies** on automation **processes** and **products** and on **system engineering**.

SOFTWARE & MACHINE EXPERIENCE:
We have high **software related skills** and We apply modern **delivery** methodologies as **user centered design** and **Agile** project management.

Comau in the world

MI, USA
CA, USA
MEXICO
BRAZIL
ARGENTINA
UK
GERMANY
FRANCE
SPAIN
ITALY
ROMANIA
TURKEY
RUSSIA
KUNSHAN
SHANGHAI
INDIA

● DIGITAL HUB

What is in.Grid?

in.Grid is the Comau platform that allows you to shape Industry 4.0 in line with the **Smart Factory Concept**.

It creates a powerful network for the exchange and acquisition of data that interconnects **Comau and non-Comau machinery** in order to acquire performance and process data in the most useful and accurate way possible. The data is then displayed and made available through a simple and interactive interface.
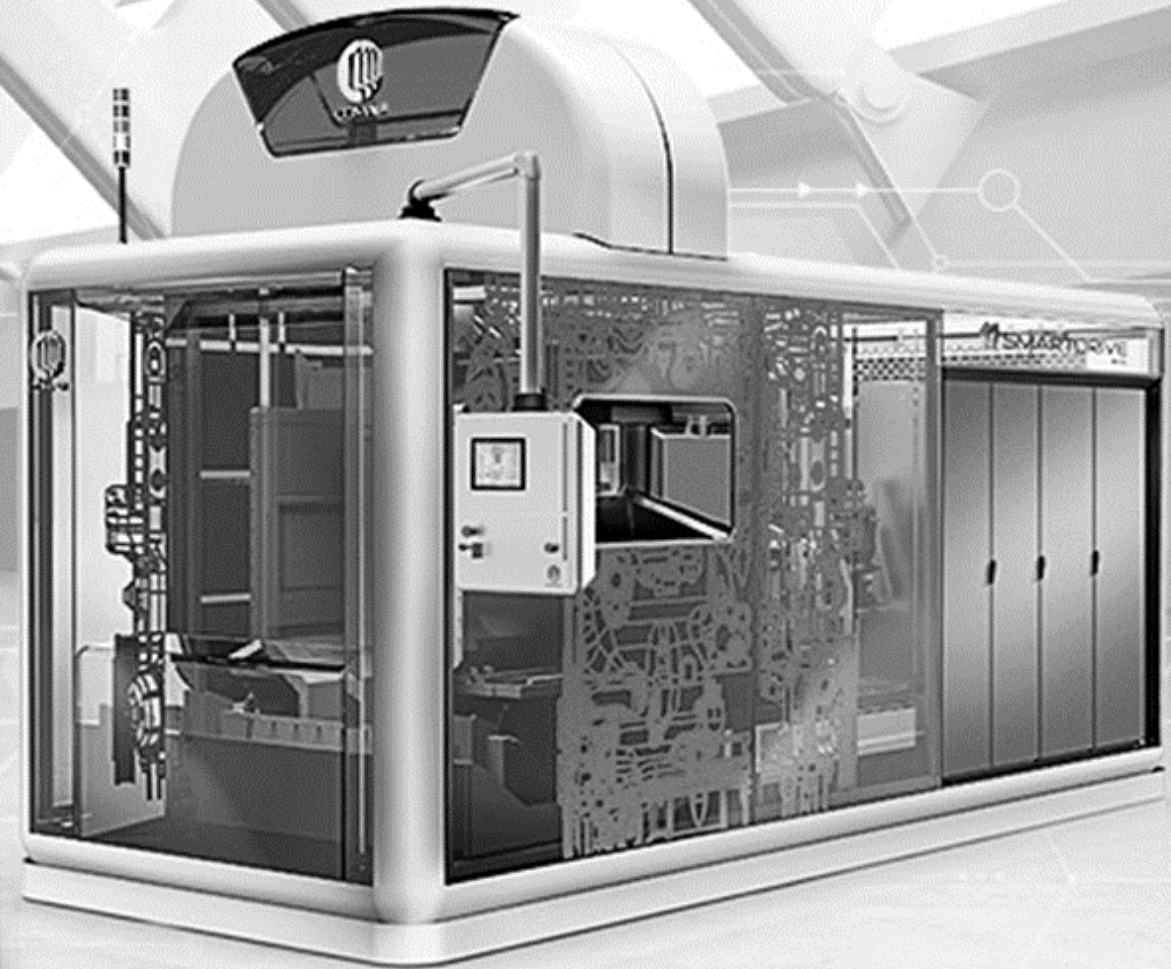
COMAU: The partner to OT and IT integration
Connecting factories dots and integrating into a unique solution

Customer

Manufacturing, IT, autonomous and professional maintenance labors, management teams among others

Manufacturing Data from any Brand

Integration with Customer legacy software, data lake, ERP systems

Design Thinking

In.Grid Modular Platform

Customer OT Assets

Field Data

Simultaneous Engineering Domain Expertise Platform, modules and technologies

Customer IT Assets

Business Data

OT/IT/IoT Local Partner

COMAU Digital Regional

Solution Integration

Market Approach
A Digital Roadmap together with Customer

❖ Customer Digital Assessment
Identification of Digital Proposal Solution
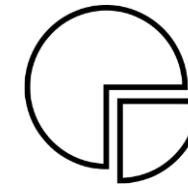
❖ POC
Definition of building blocks ;Setup of blocks; Development environment solution is built; Verification of results with customer
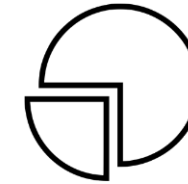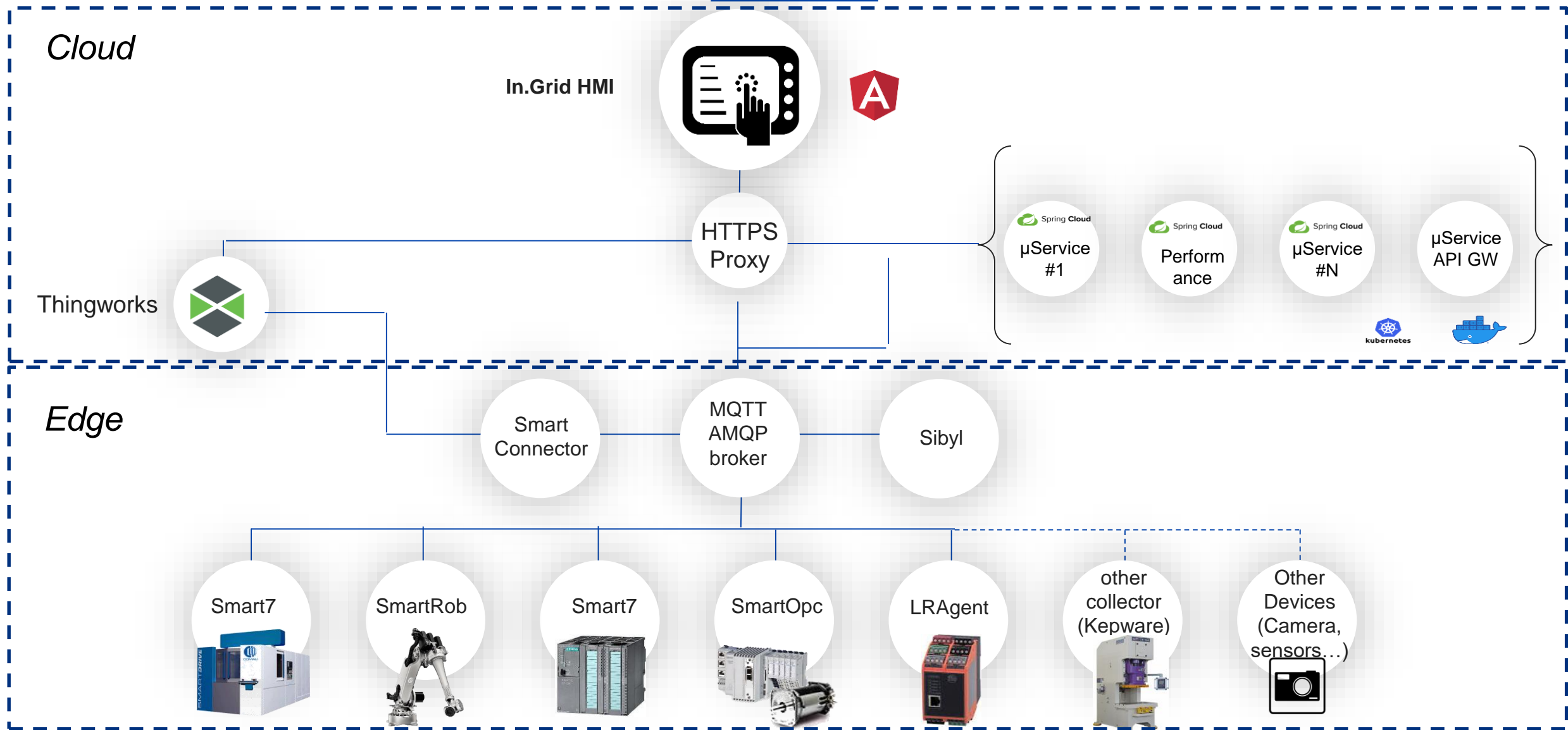
❖ Pilot
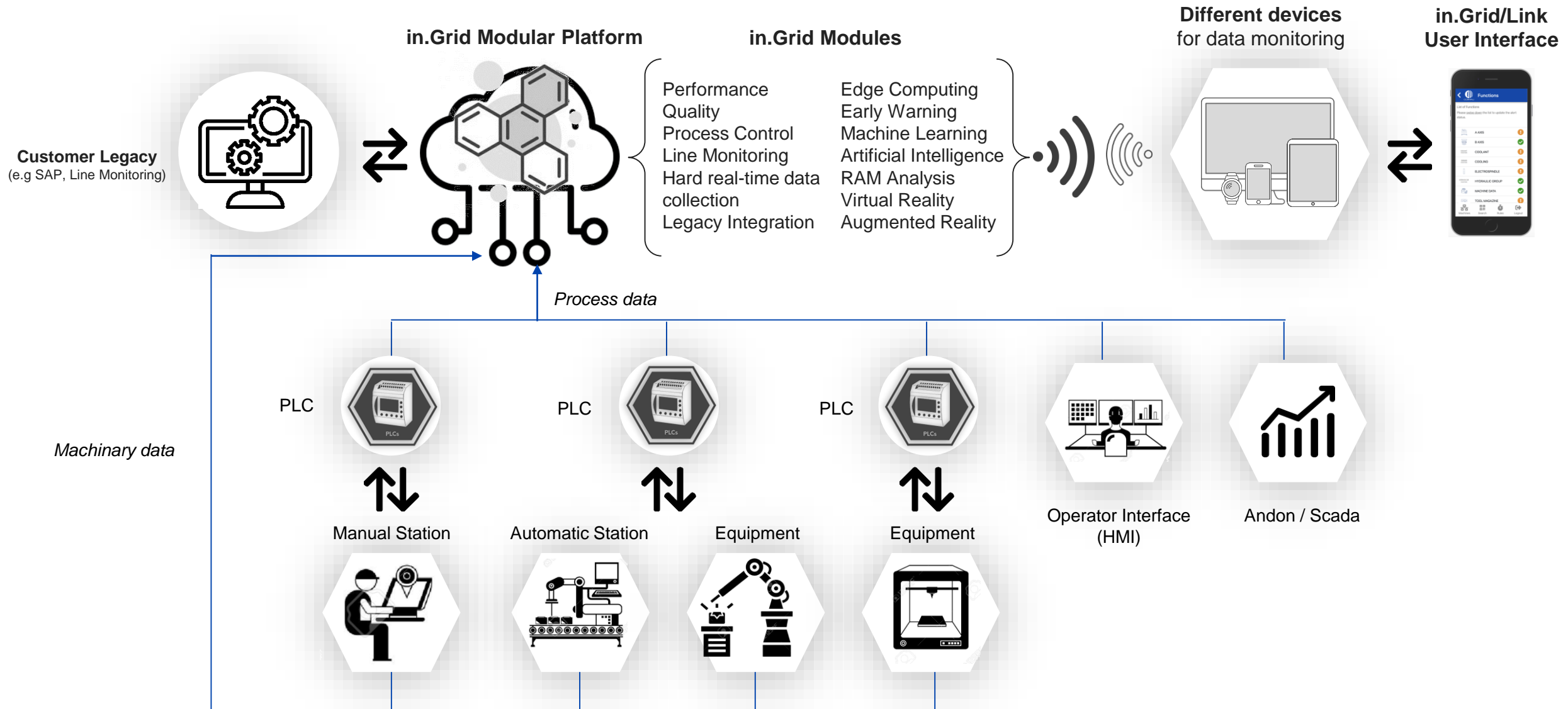From Development to Productions Environment; Final hardware architecture set-up
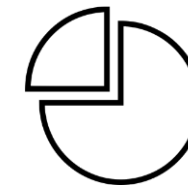
❖ Expansion
Auto-scaling; Automatic security updates and data recover systems

In.Grid Building Blocks Solution

in.Grid Architecture

Architecture Overview
Data Collection & Functionalities

in.Grid Modular Platform

in.Grid Modules

Different devices for data monitoring

in.Grid/Link User Interface

Customer Legacy
(e.g SAP, Line Monitoring)

Performance
Quality
Process Control
Line Monitoring
Hard real-time data collection
Legacy Integration

Edge Computing
Early Warning
Machine Learning
Artificial Intelligence
RAM Analysis
Virtual Reality
Augmented Reality

Process data

Machinary data

PLC

PLC

PLC

Manual Station

Automatic Station

Equipment

Equipment

Operator Interface (HMI)

Andon / Scada

Architecture Overview
Focus on Green Field and Brown Field

in.Grid Modular Platform

Customer Legacy
(e.g SAP, Line Monitoring)

Process data

Machinary data

Different devices
for data monitoring

**in.Grid/Link
User Interface**

Edge Computing
Early Warning
Health Monitoring
Machine Learning
Artificial Intelligence
RAM Analysis
Virtual Reality
Augmented Reality

Green Field

Process Management
Recipes
Performance
Quality
Labor Management
Production Dispatching
Quality Control

Brown Field

Performance
Quality management

Technical Contents – in.Grid/Link Architecture

in.Grid Package Edge PC for Robotics

COMAUplus

Different devices
for data monitoring

in.Grid/Link User Interface

in.Grid Platform On Cloud

Ethernet Connection Local LAN

HTTPS

HTTPS over Wi-Fi

Client Edge PC

Robots + Controller
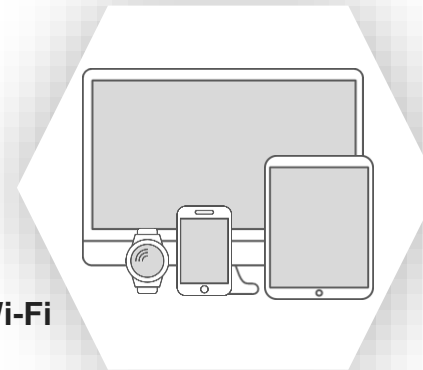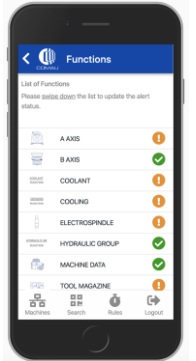
FEATURES

Machine communication
- *Reliable machine data collection*
- *Multi-protocol connectivity platform*

Open platform
- *Customizable upon customer requests*
- *Any machine integration possible*

Overall operation status
- *Monitoring, history, report*
- *Equipment & component status*

in.Grid/Link – User Interface

LOG AND DEVICES MANAGEMENT

LIST OF CONNECTED DEVICES

LOGIN AND DEVICES MANAGEMENT

LIST OF MONITORED FUNCTIONS

LOGIN INSIDE EACH MACHINE

In.Grid/Link Web HMI For Comau IoT

MACHINE QR CODE SCANNING TO IMMEDIATELY ACCESS RELEVANT DATA

ROBOT AND COMPONENTS HEALTH STATUS CHECK

LIST OF FUNCTIONS DISPLAYED

REAL-TIME DATA DISPLAY OF EACH COMPONENT

Made in Comau
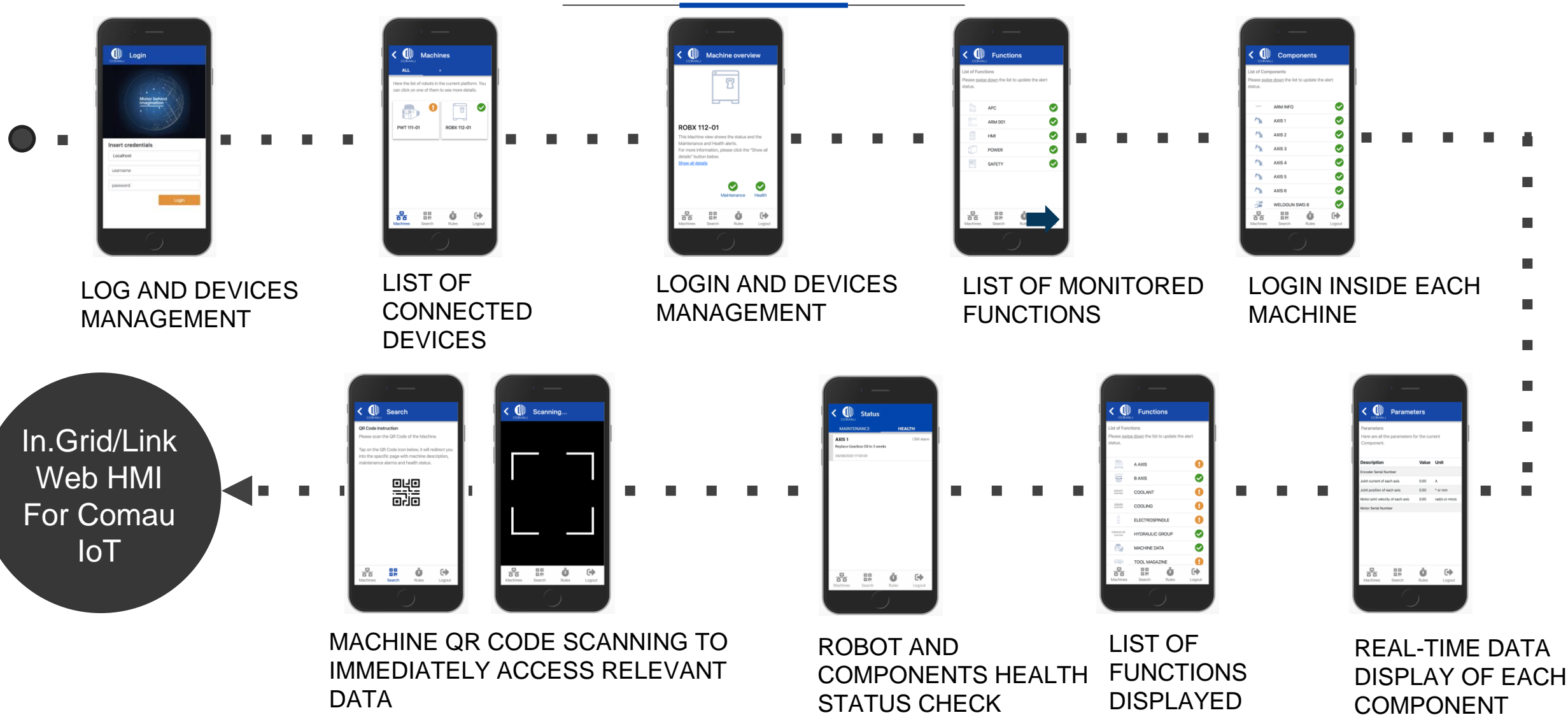
in.Grid/Link
User Manual

in.Grid/Link User Manual
Login & Customer Connected Equipments List

Login screen with "Motor behind imagination" graphic.

Insert credentials
- Localhost
- username
- password

LogIn
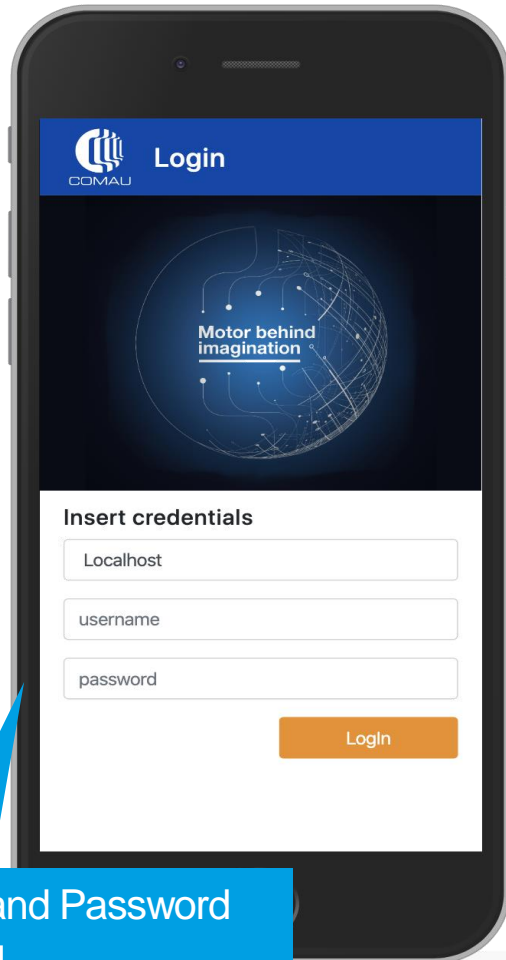
Type Username and Password provided by Comau

Machines screen — ALL / +

List of connected machines from specific customer are shown

Here the list of robots in the current platform. You can click on one of them to see more details.

Robot 01 | Robot 02
Robot 03 | Robot 04

Immediate check of machine status

Machines | Search | Rules | Logout
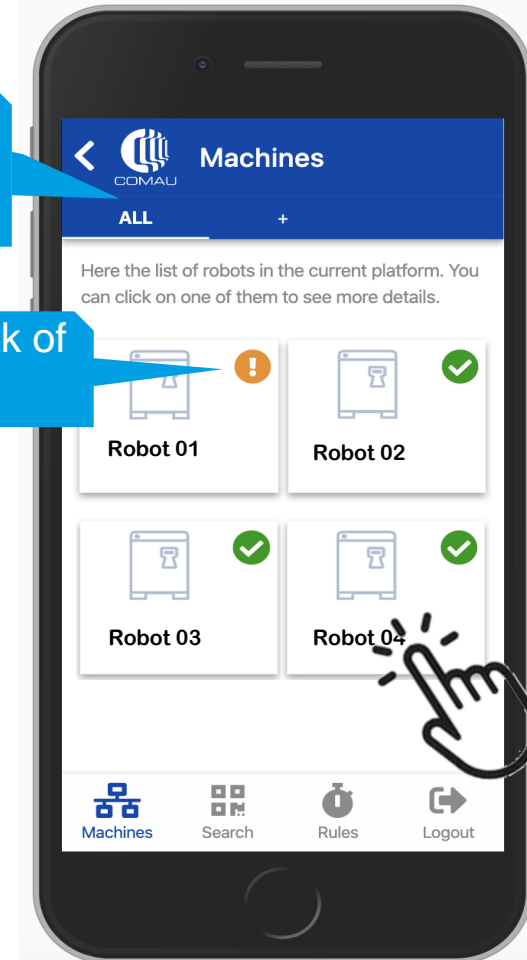
Click on desired machine to real-time information

in.Grid/Link User Manual
Machine Overview & Function of Comau Robots

Clicking on Device figure, a detailed page listing **Functions** of **Machine**

Machine name

ROBX 112-01

This Machine view shows the status and the Maintenance and Health alerts.
For more information, please click the "Show all details" button below.

Show all details

Status regarding **Health Maitenance** of machine

Maintenance   Health

Machines   Search   Rules   Logout

Clicking on it, related alarm page is opened

List of all functions with related status

Functions

List of Functions
Please swipe down the list to update the alert status.

APC

ARM 001

HMI

POWER

SAFETY

Machines   Search   Rules   Logout

Clicking on any function, the a further detailed page containing it components will be opened

in.Grid/Link User Manual
Components – Comau Robot Arm & Function of Comau Machining

List of all components with related status

Clicking on any component, the parameter page with real-time data will be shown

List of all functions with related status

Clicking on any function, the a further detailed page containing it components will be opened

in.Grid/Link User Manual
Parameters Page & Search Page

Real-time data from parameters of Machine
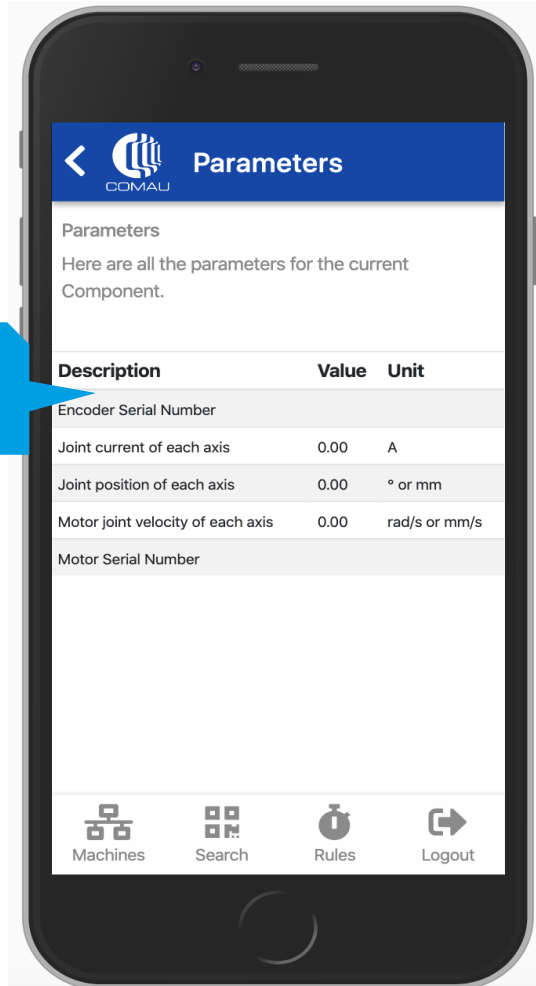
List of current Alarms divided into Health and Maintenance categories
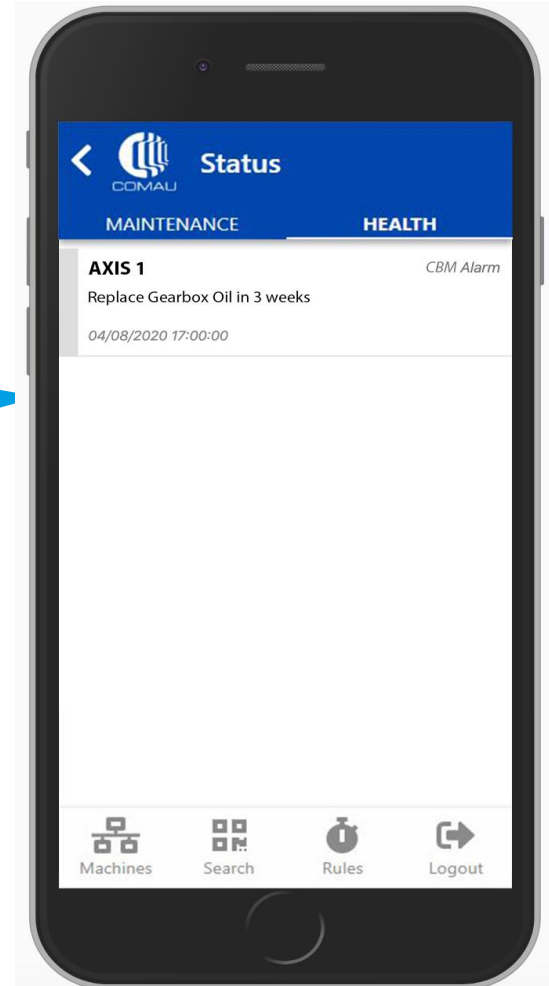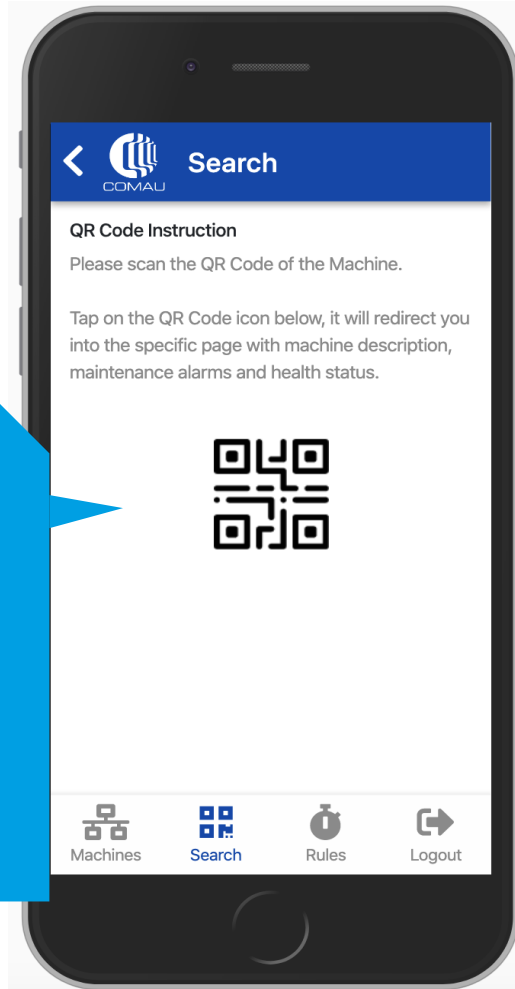
in.Grid/Link User Manual
Alarm Page

Customer can read QR code containing IP address of machine, in order to quickly access specific machine page-

Tip: COMAU suggests to print QR codes and place in in front of cells.
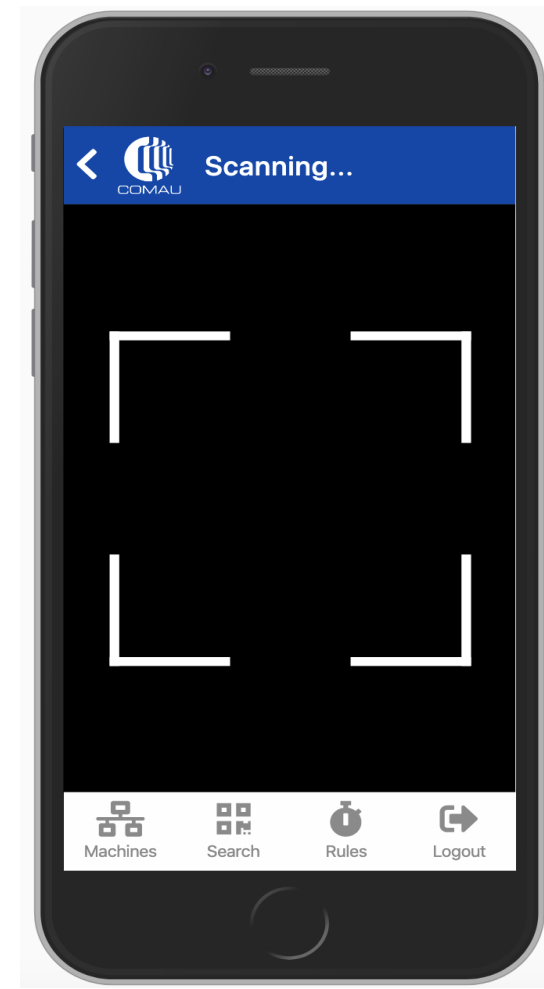
COMAU

Motor behind imagination

A brand of **FCA**
FIAT CHRYSLER AUTOMOBILES