Improved Availability and Damage Avoidance at a Water Treatment Plant Using Asset Analysis

Mitsubishi Electric e-F@ctory Strategy and Business Planning; Global Alliances

Joint presentation: Mitsubishi Electric,
Schaeffler Group

July 2016,
ARC Forum Bangalore, India

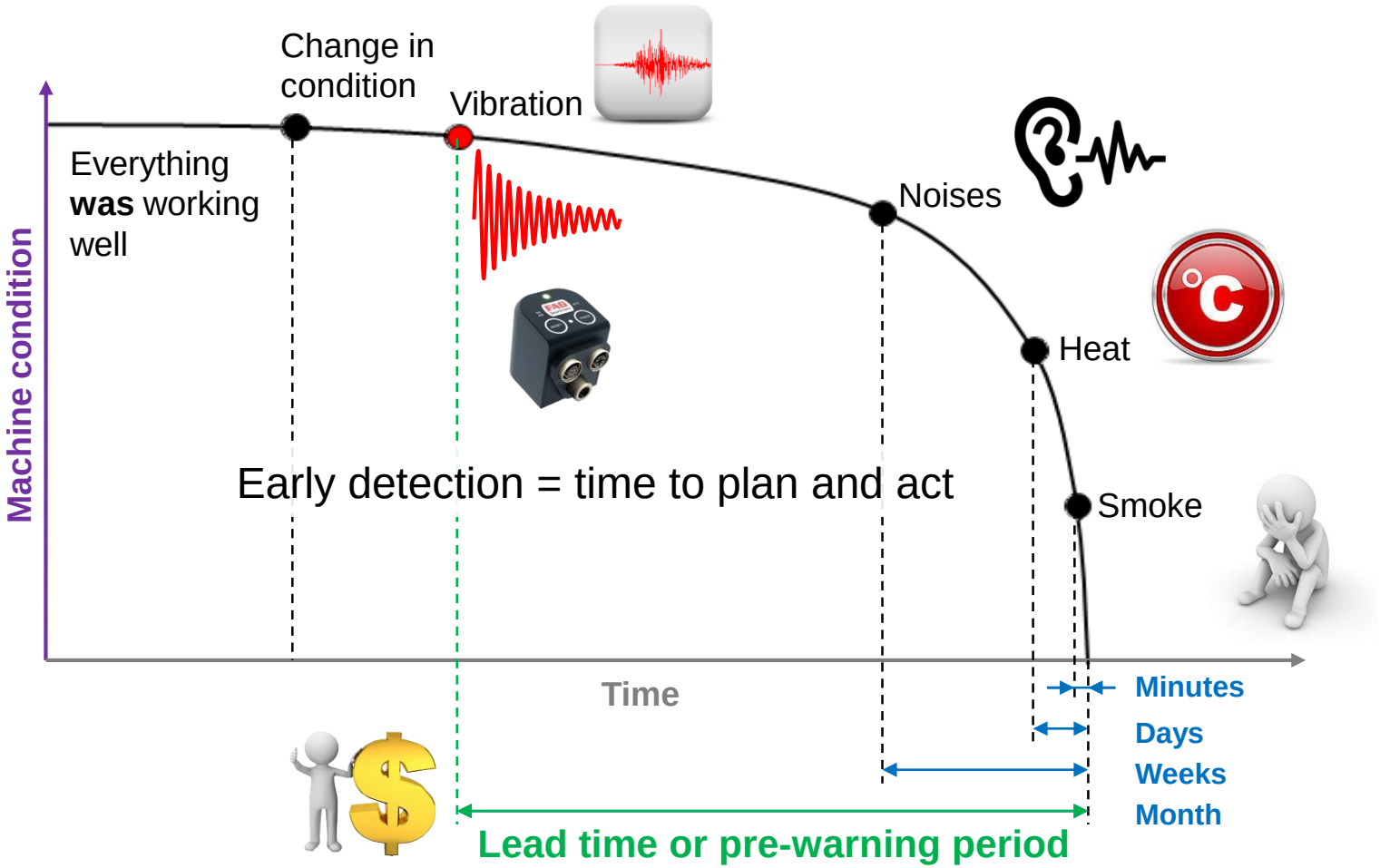
Introduction

Mitsubishi Electric:

Changes for the Better

- Integrated electrical/electronics supplier
- Established 1921
- 4,394.3 billion Yen consolidated net sales
(for the year ending March 31st 2016)

When it all goes wrong



Background

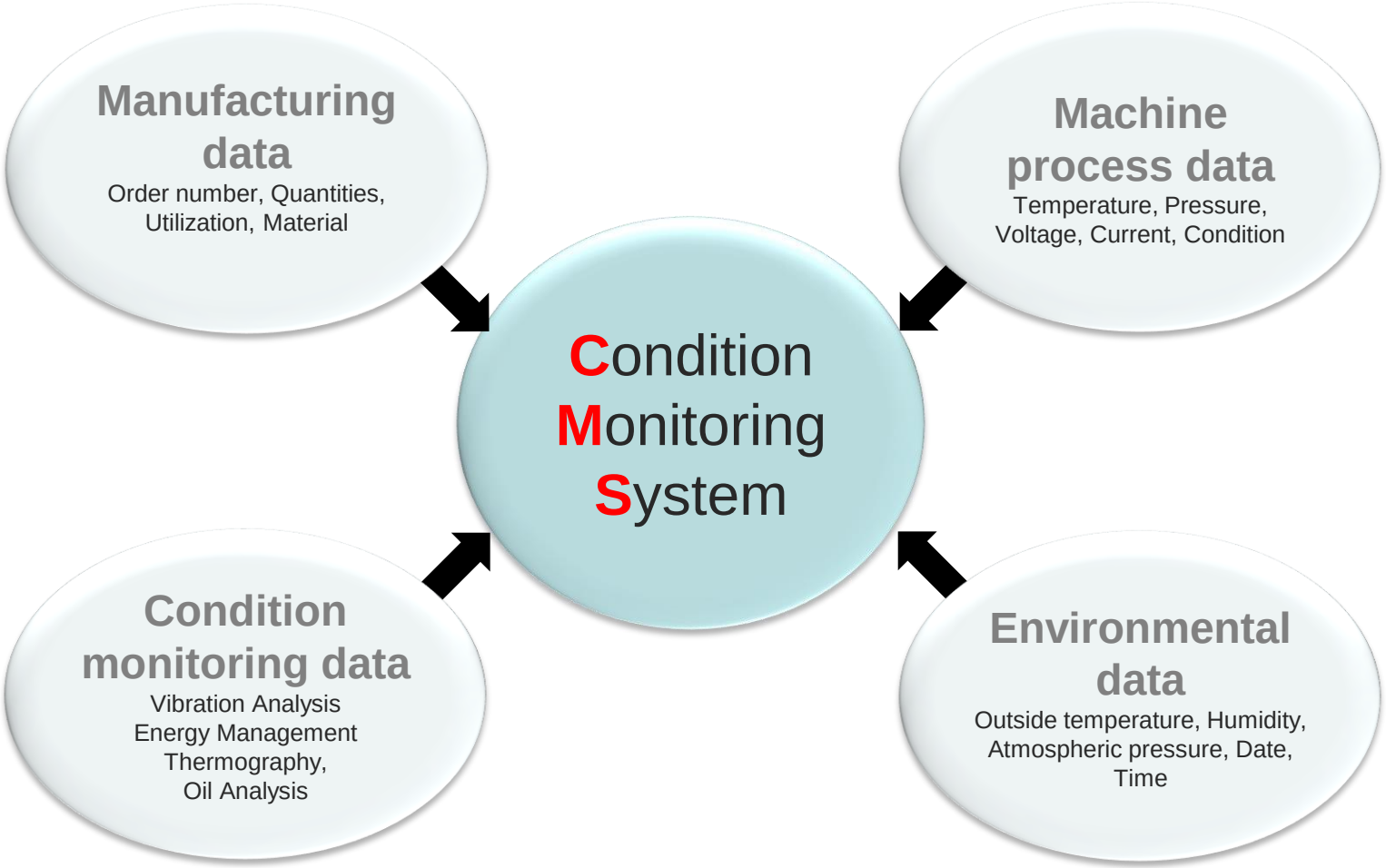
CMS

Condition

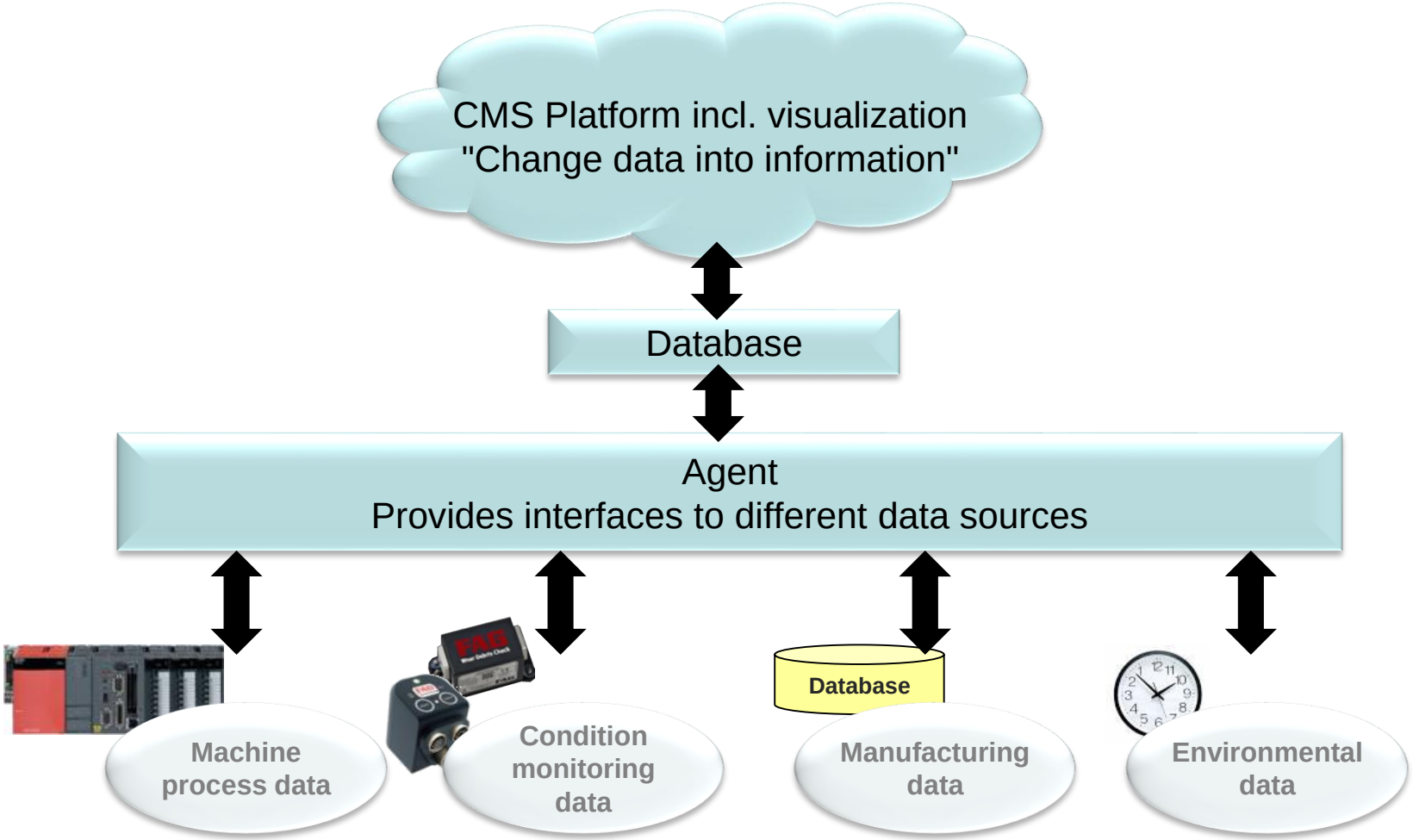
Monitoring

Systems

What is the CMS measuring?



Sharing and analyzing



Scalable and widely applicable

Reference	Case 1	Case 2	Case 3
	Device	Machine	Line
	Process	Hybrid	Discrete
	Local + Cloud	Local + Plant cloud	Local + Private cloud
zone		machine	

Applied Condition Monitoring

Schaeffler Group at a glance

- Integrated automotive and industrial supplier
- Around 84.000 employees in 50 countries
- Established 1883
- Above industry average profitability and revenue growth
- Strategic participation in Continental AG
- € 12,1 billion annual turnover

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Waste Water Treatment Plant

Company: Stadtwerke Rotenburg an der Fulda (Public utility company)

Application: unmanned remote waste water pumping station

Processing capacity
Maximum: equivalent 34,000 people
Average: equivalent 20,000 people

Requirement: 1) no loss of service,
2) cope with unplanned demand
3) reduce energy usage

Condition: Typical gearbox/motor breakdown within 1 – 3 years

Configuration/system

Number of pumps: 3 Archimedes screw type

Configuration: Directly mount motor on gearbox driving auger screw

Operating cycle: 24hrs/day, 7 days/week

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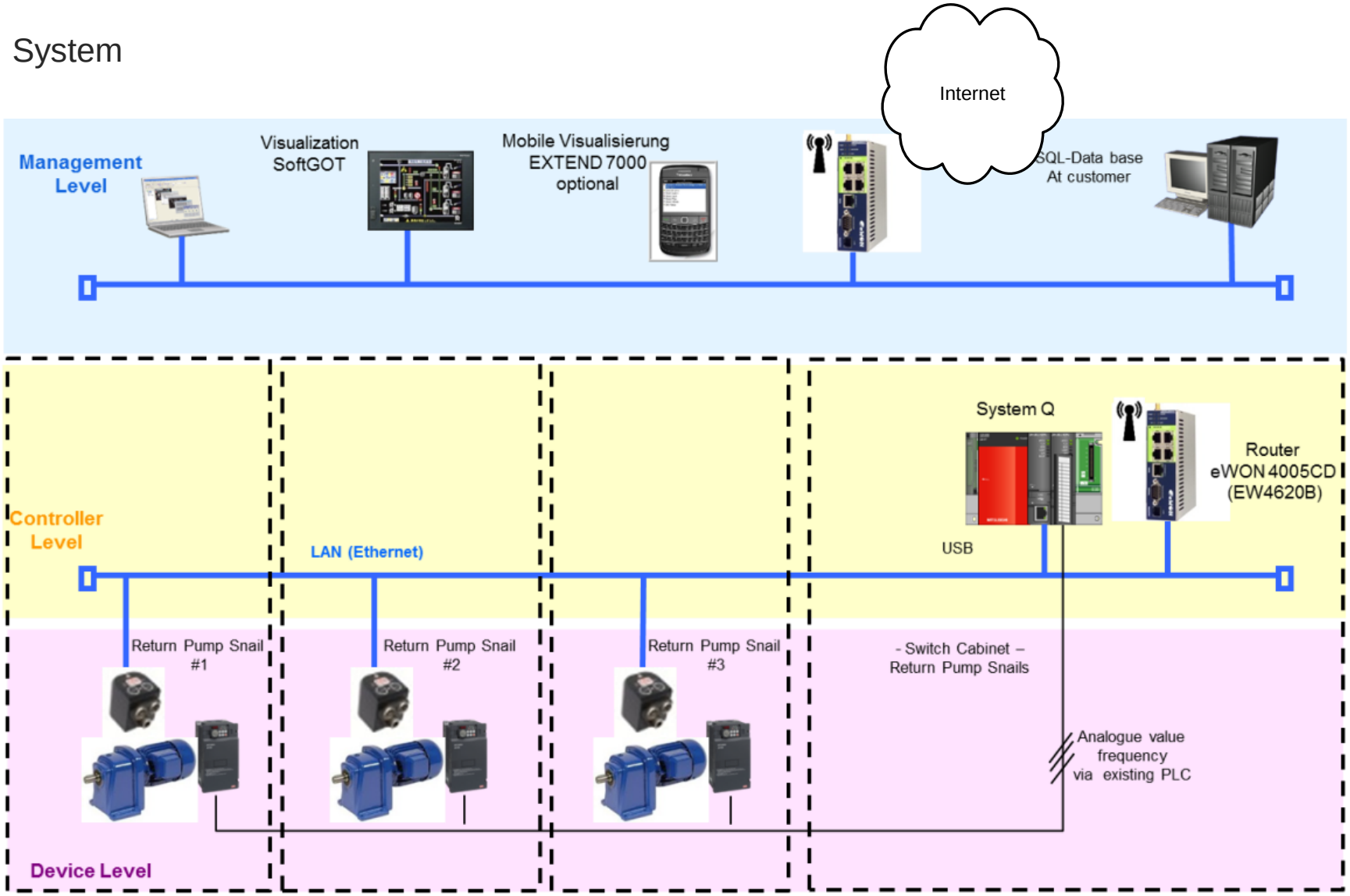
Waste Water Treatment Plant

System



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Waste Water Treatment Plant

Cost analysis

Overhaul the gearbox: 1000 Euro

New gearbox: 5500 Euro

Solution cost

Hardware: 4700 Euro

Installation: 1000 Euro

Total 5700 Euro

Return on Investment:

Estimated: 2 gearbox failures

No CMS: Failure x2 = 5500 x2 = 11000 Euro

CMS: Solution cost + 2x gearbox overhaul

= 5700 + (2x1000) = 7700 Euro

Benefit: 3300 Euro saving on 2 failures + no loss of service

Benefit in practice:

4 months after installation a gearwheel defect was detected

Solution delivery:

Local
system integrator: Willich Elektrotechnik GmbH
Sensor technology: Schaeffler
Hardware: Mitsubishi Electric
IT connectivity: eWON

Result:

Improved OEE: predictive maintenance ensures continuous services and preemptive maintenance actions reduce cost of failure

Paper Mill

Company: Mitsubishi HiTec Paper Europe GmbH

Application: cooling system for paper mill producing coated thermo-sensitive paper

Processing

Speed:	1730m/min (103.8 km/hr)
Paper roll:	9000kg per roll (2.9m wide) (150,000,000 kg/yr)
Machine height:	4 stories (floors)

Requirement: 1) no loss of service,
2) aid planned maintenance
3) no machine damage

Configuration/system

Number of cooling fans: 26
Weight of 1 fan impeller: 100kg
Impeller speed: 1500rpm
Target temperature: below 68 deg C (starting temp. 250 deg C)

Paper Mill

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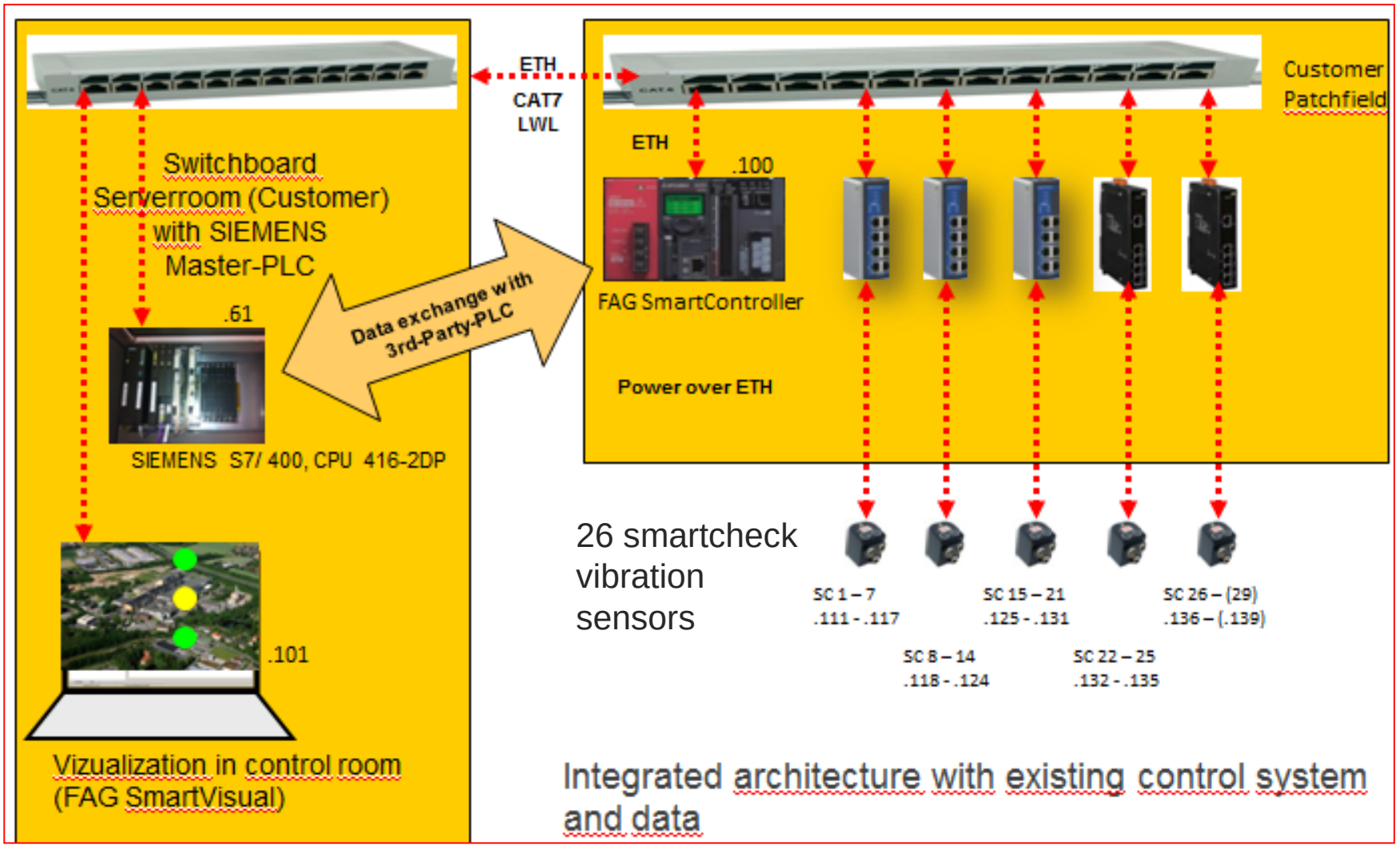
System



Paper Mill

Cost analysis

Cost of 1 roll: 12000 Euro

Solution cost

Hardware: 19500 Euro

Installation: 6000 Euro

Total 25500 Euro

Return on Investment:

Estimated: 3 rolls of paper

No CMS: Failure x3 = 12000 x3 = 36000 Euro

CMS: Solution cost = 25500 Euro

Benefit: 10500 Euro saving on 3 failures + no loss of service, no machine damage

Solution delivery:

Local system integrator: Carl Werthenbach Konstruktionsteile GmbH & Co. KG

Sensor technology: Schaeffler

Hardware: Mitsubishi Electric

Result:

Achieved continuous running process, no machine damage, now utilizing planned maintenance/service

Solution rolled out to second plant.

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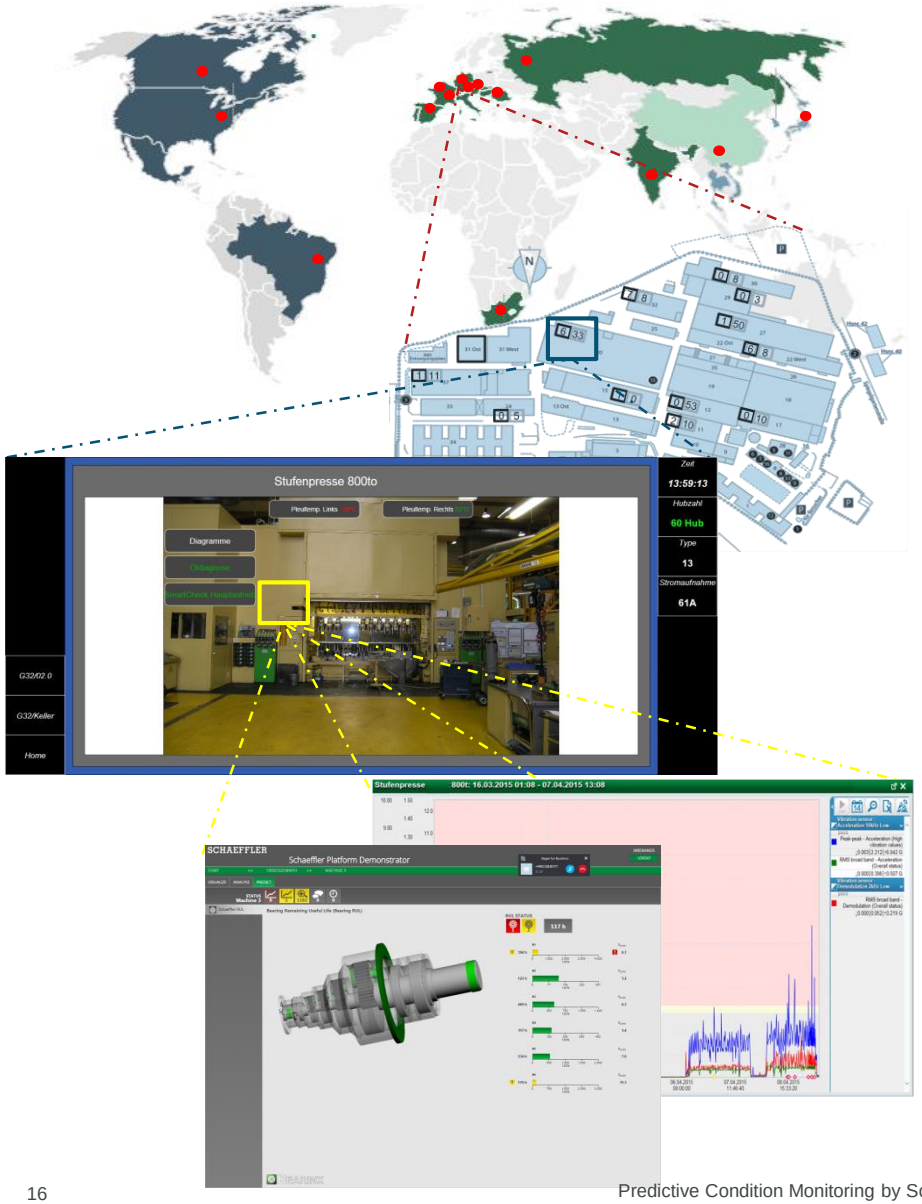
Manufacturing line



Company: Schaeffler GmbH

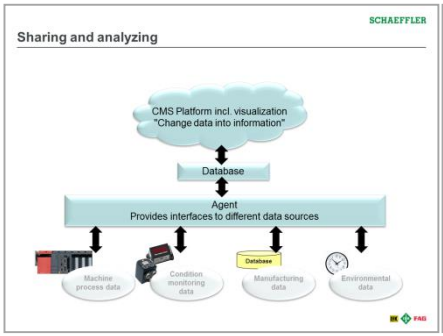
Application: bearing production (stamping, pressing, turning, welding, coating of bearings and bearing components)

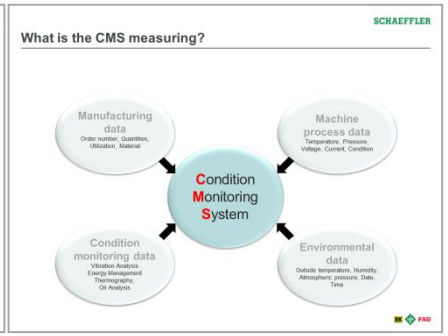
Processing

Products per year:	840million
Material input:	65,000 tons of steel
Work space:	77,000m²
Operations:	3500 employees working 24/7

Requirement: 1) no loss of service,
2) aid planned maintenance
3) no machine damage

Configuration/system





Manufacturing line

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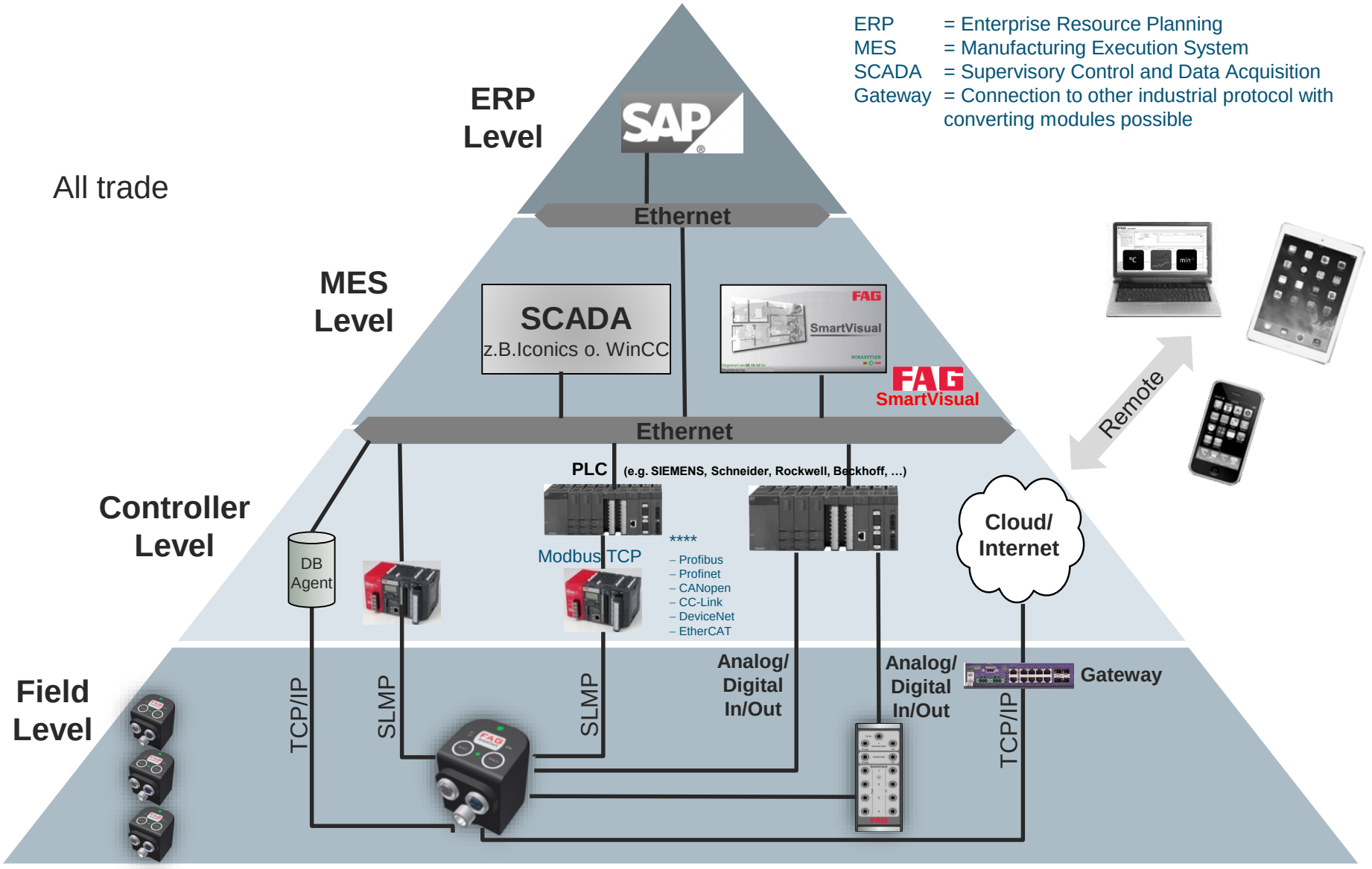
ERP = Enterprise Resource Planning
MES = Manufacturing Execution System
SCADA = Supervisory Control and Data Acquisition
Gateway = Connection to other industrial protocol with converting modules possible

All trade



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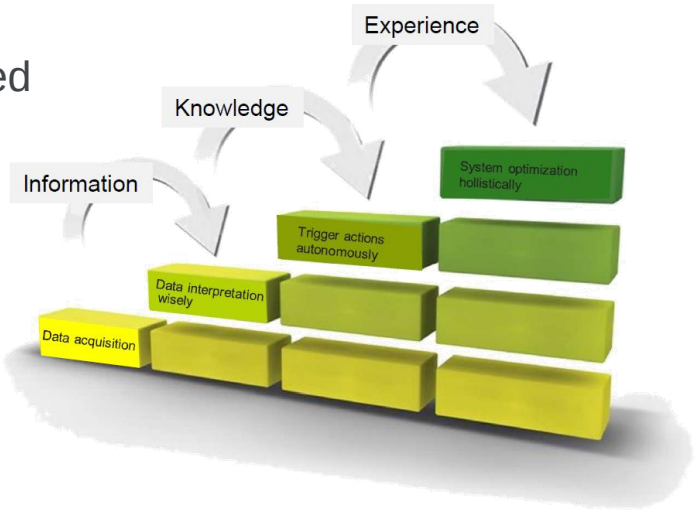
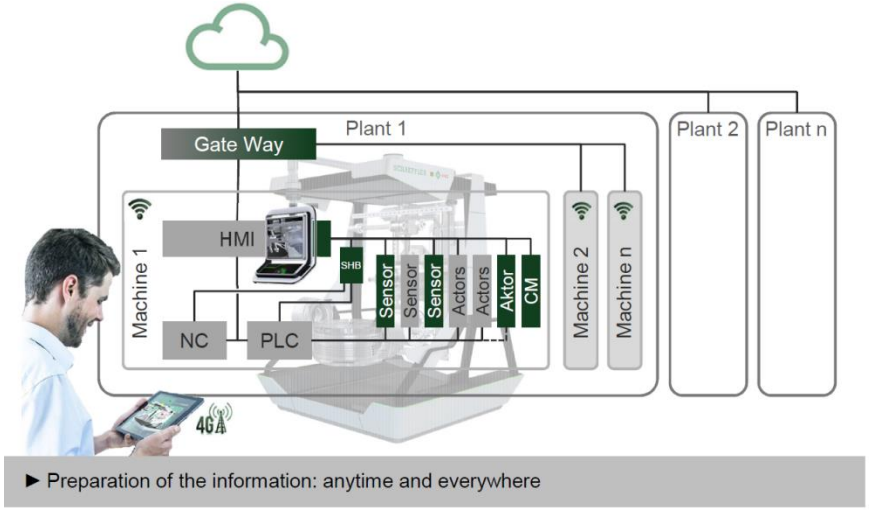
Manufacturing line

Result:
Accumulated knowledge

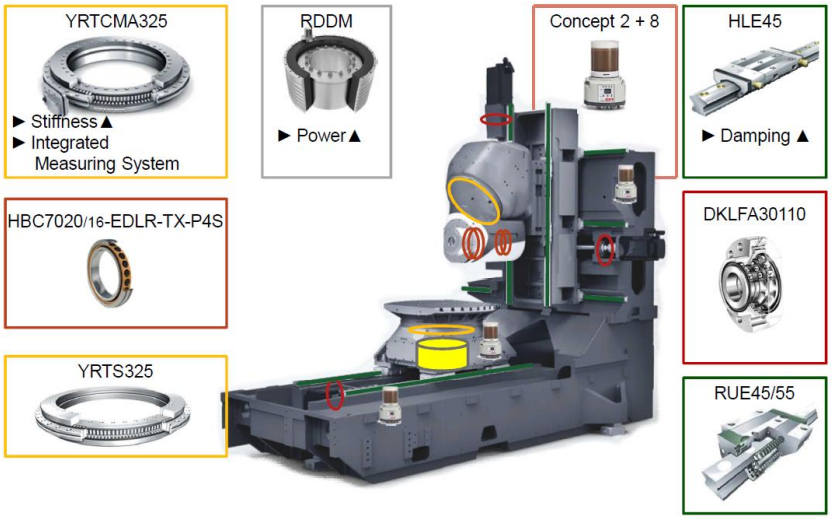


Preparation for the future



► Preparation of the information: anytime and everywhere

Deeper appreciation and understanding



Return on Investment:

Priceless!
We will be implementing at our other factories

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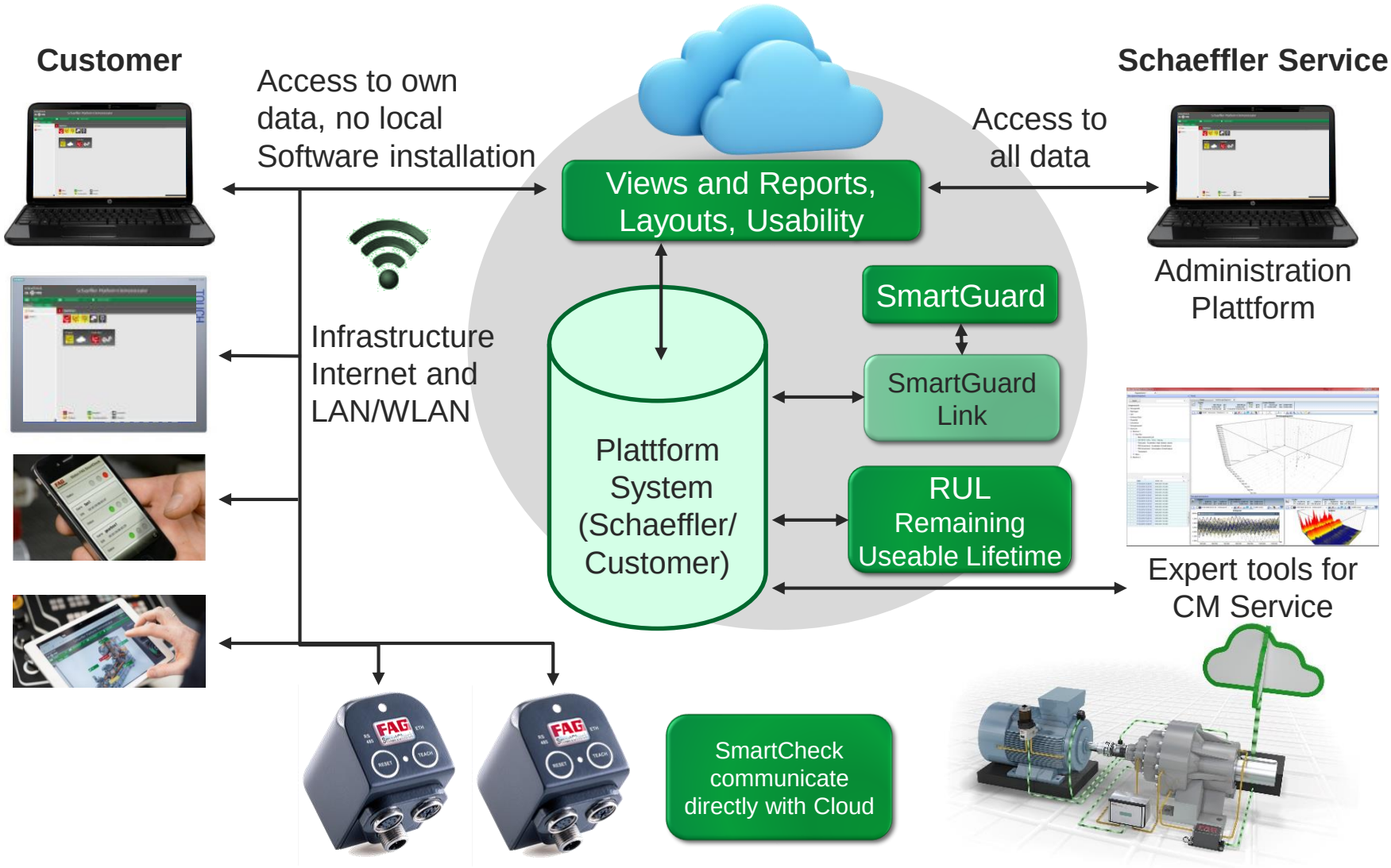
And the future?

Smart Products and Services HMI 2016 (available for pilots)



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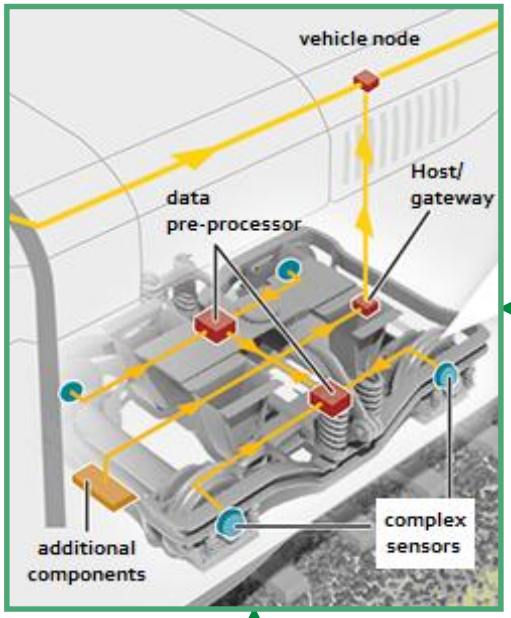
Overview

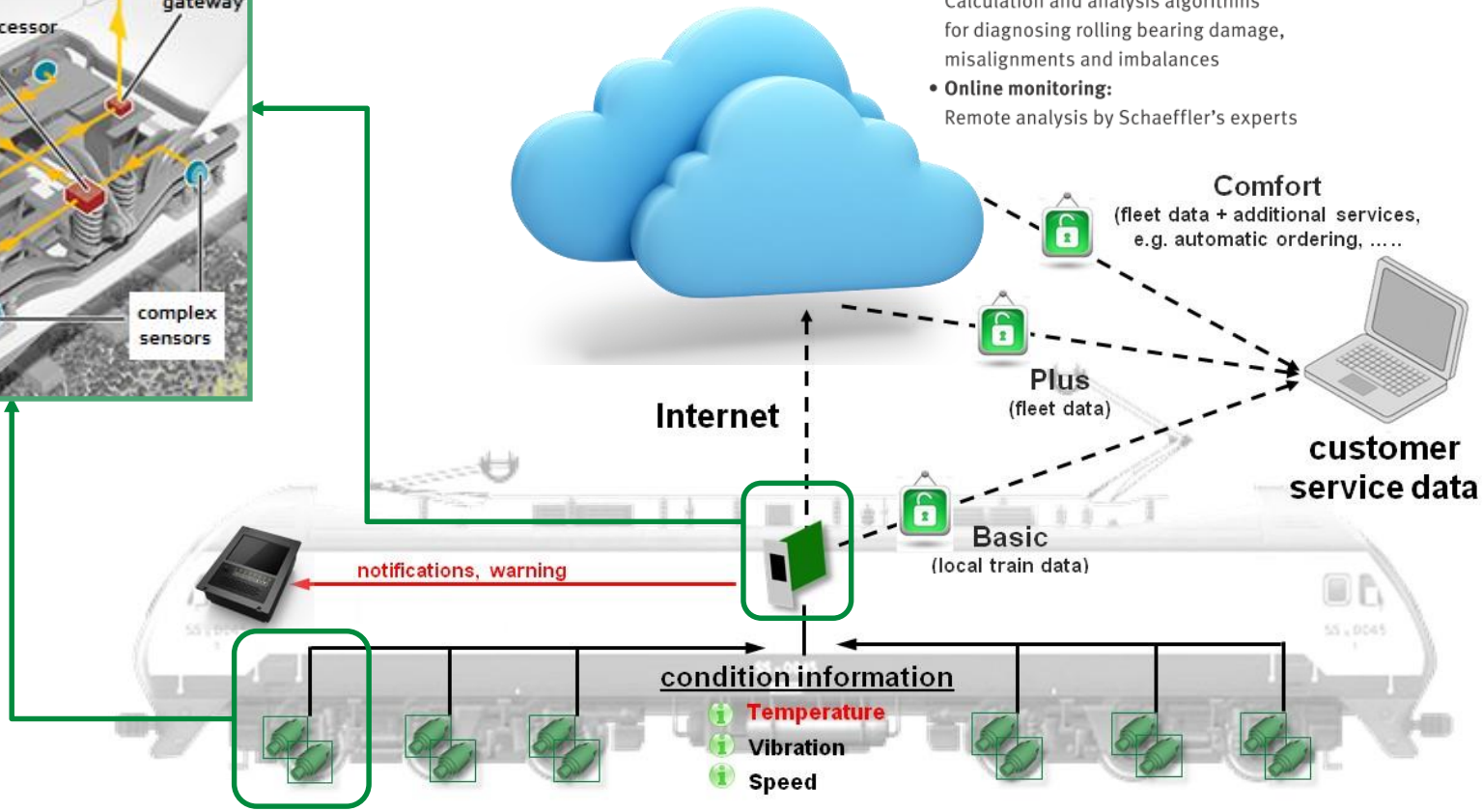


Overview of the condition monitoring system implemented on bogies, with signal detection, data processing and diagnosis which delivers bearing health status.

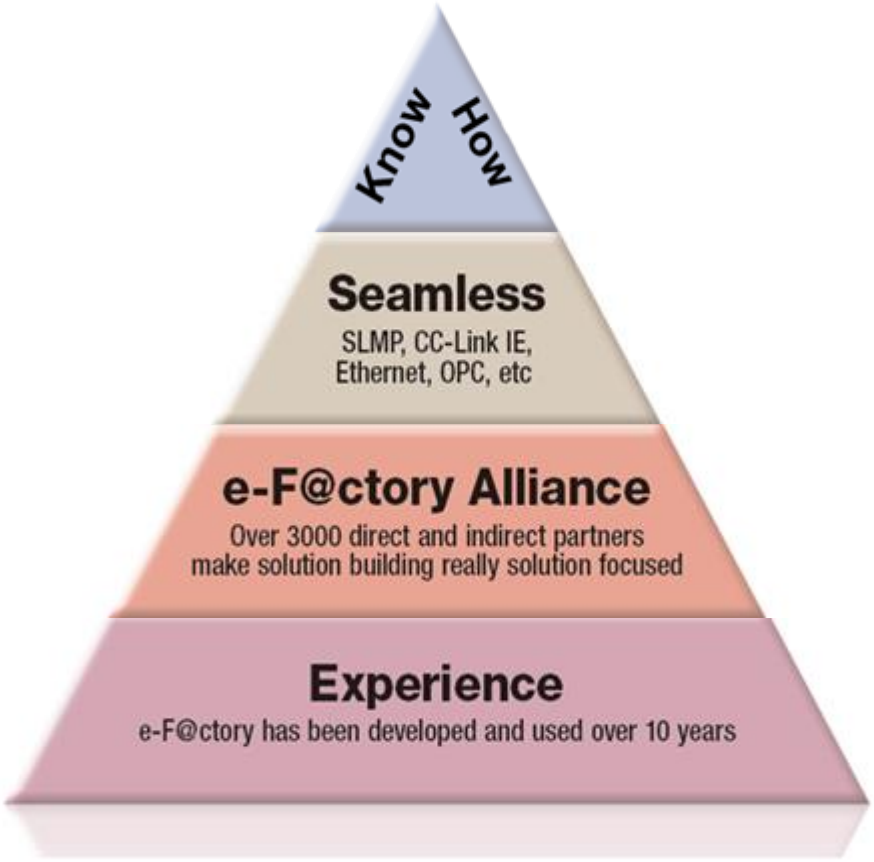
Schaeffler Cloud

Secure storage and reliable retrieval of data

- **Calculation of remaining service life:** Determines the optimum time for maintenance
- **Automatic diagnosis of rolling bearings:** Calculation and analysis algorithms for diagnosing rolling bearing damage, misalignments and imbalances
- **Online monitoring:** Remote analysis by Schaeffler's experts



Collaboration and “know-how”



IIoT, Industrie 4.0 are complex manufacturing environments – to maximize the opportunity collaboration is required

e-F@ctory Alliance

MITSUBISHI ELECTRIC
Changes for the Better

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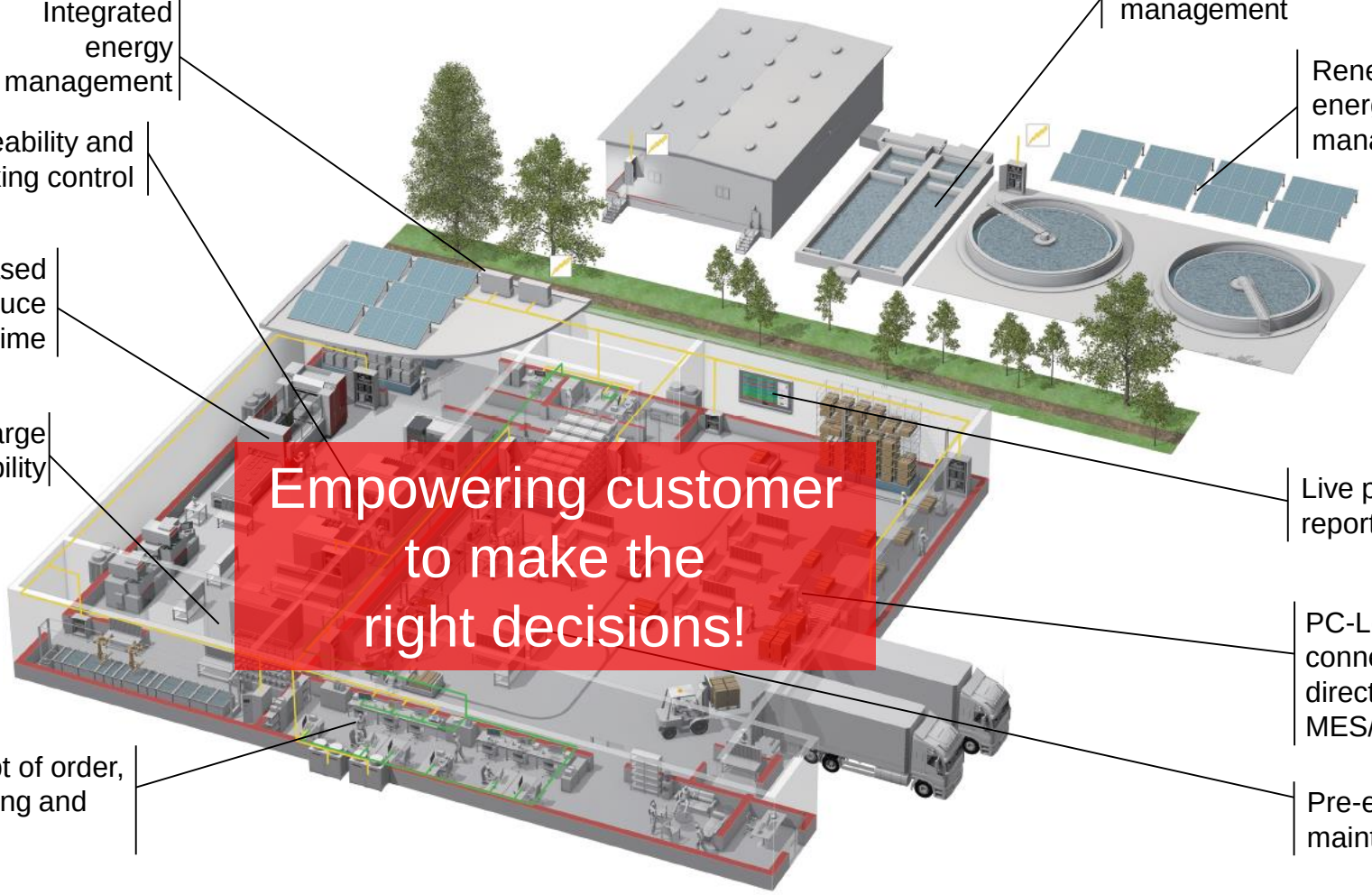
Together we make solutions!



THANK YOU!

