

**The Future of Manufacturing
as envisioned by Mitsubishi Electric**

e-Factory

*~ "Manufacturing" that evolves
in response to environmental changes ~*

December, 2019
Mitsubishi Electric India



1 Environmental Changes in Manufacturing

2 What is e-F@ctory? 

3 Edge Computing Platform  **EDGECROSS**

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Environmental Changes in Manufacturing

e-Factory



Advancement of IT and Information Infrastructure

Manufacturing is surrounded with increasingly complex business environments

Utilization and Expansion of IT/IoT

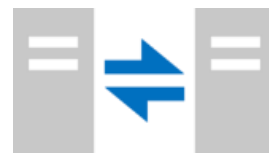
Data collection

Sensing



Data communication

High-speed communication



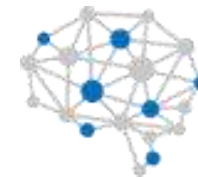
Data processing

Cloud,
Edge computing



Data analysis

Simulation,
AI



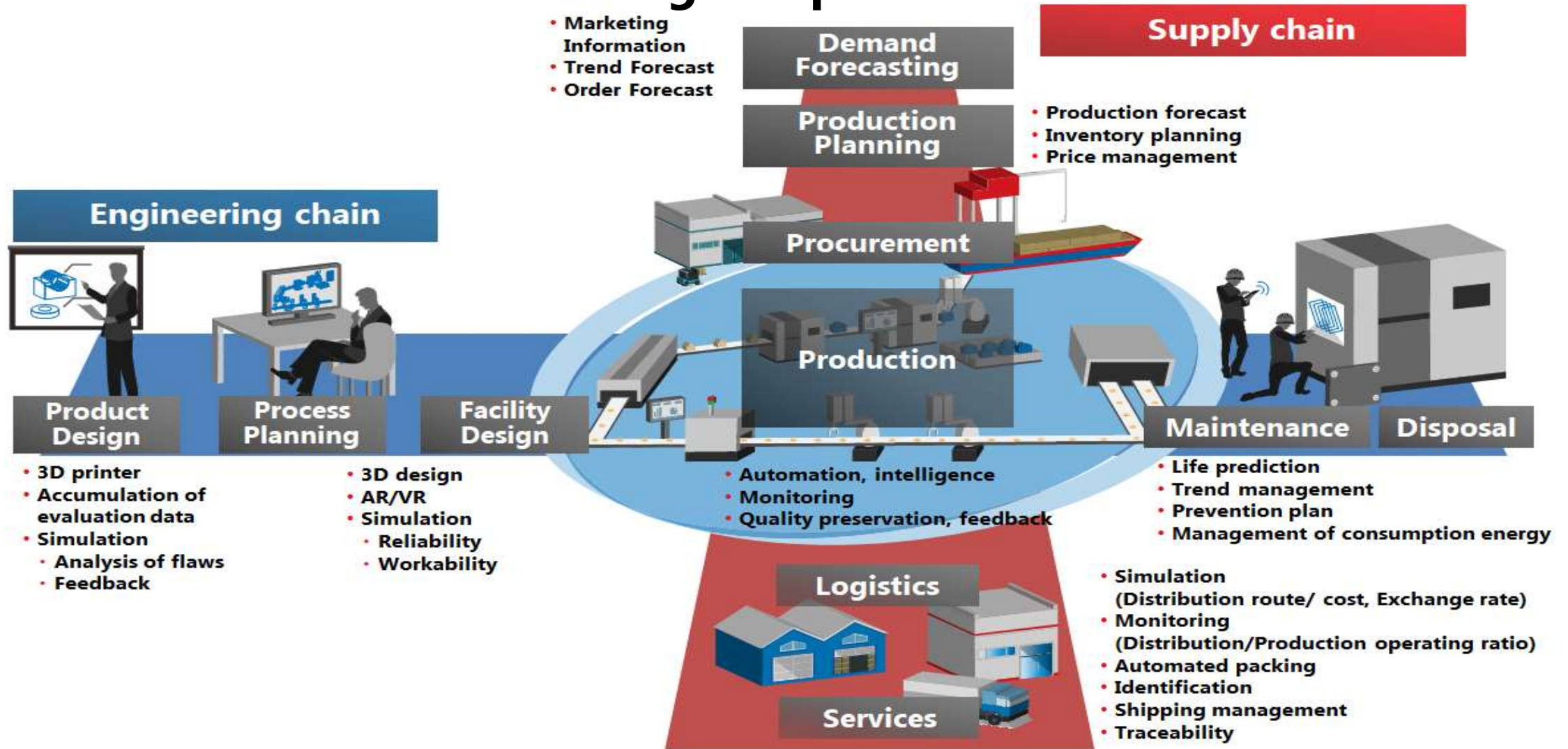
Diverse, sophisticated customer needs

Reduction of management cost, TCO

Variable product and variable production

Automation, Quality enhancement

Manufacturing will increasingly use digital space



Digital space is expected to increase efficiency and shorten each process.

Toward the manufacturing evolution,
various movements have come into view around the world

- Industrie4.0 (Germany)
- IIC, Manufacturing U.S.A (US)
- **MAKE IN INDIA (India)**
- Smart Machinery (Taiwan)
- Catapult Program (UK)
- Industrie du Futur (France)
- Manufacturing Industry
Innovation3.0 Strategy (Korea)
- Thailand 4.0 (Thailand)
- **Connected Industries (Japan)**



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What is e-F@ctory?

e-F@ctory



< What should we do? >

1. Visualization

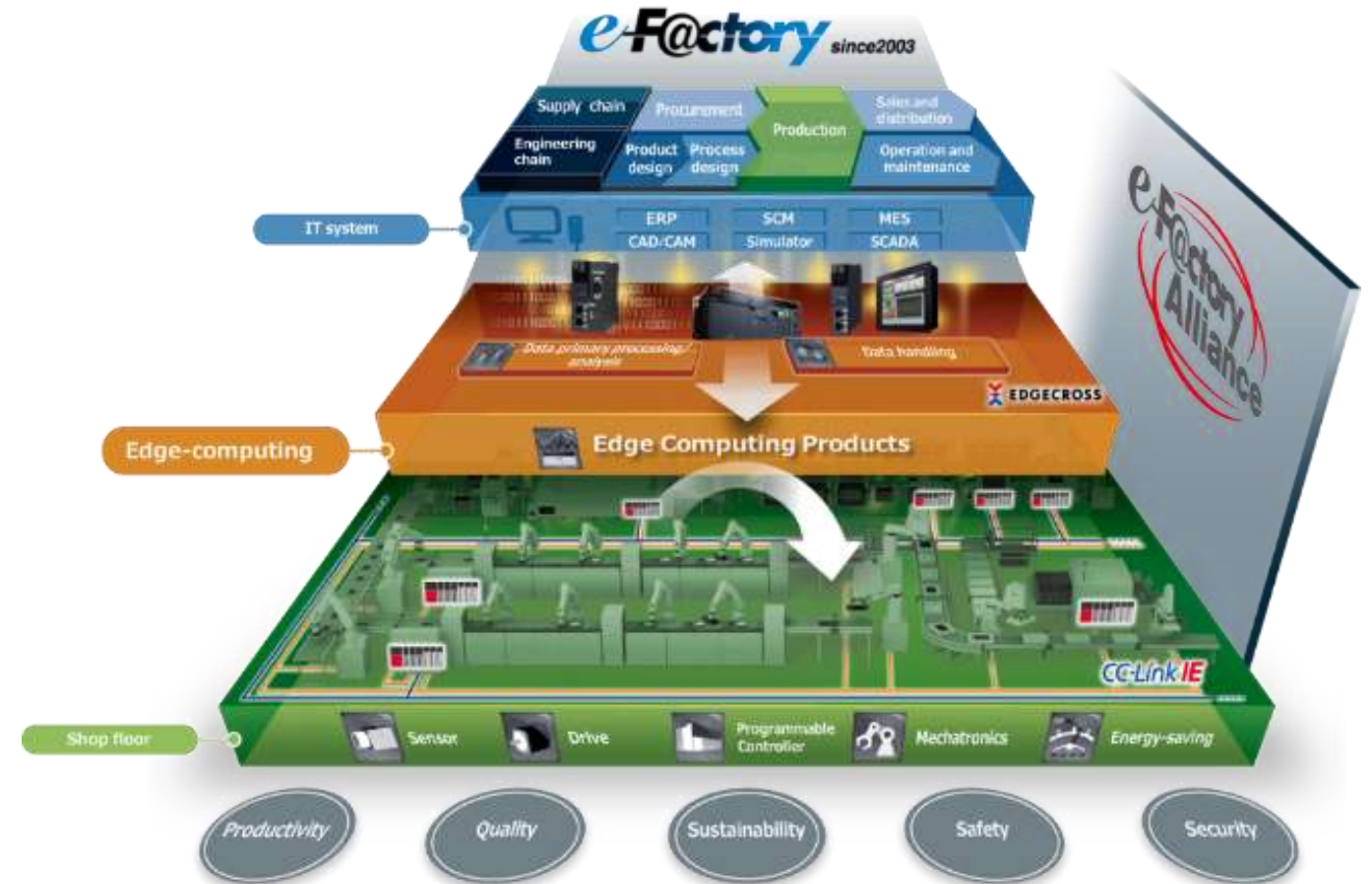
- ✓ Data collection in real time from the Shop-floor layer

2. Analysis

- ✓ Real-time data processing to produce meaningful information at the Edge-computing layer
- ✓ Passes the information to the IT-system layer for further analysis (if needed)

3. Improvement (or Optimization)

- ✓ Feedback of the results of analysis to the Shop-floor layer from both the Edge-computing layer and IT-system layer



Easy installation to existing equipment

Thousands of e-F@ctory systems has been installed additionally onto consumer's existing equipment, not only the newly added equipment.

Core technologies and products to realize e-F@ctory

Industrial Network Technology

- Large capacity, high speed, high precision and high reliability
- FA/IT-mixed communication

CC-Link IE

FA-IT Linkage Technology

- Easy connection between production site and IT system
- Primary processing and feedback in real time basis



Control Technology

- Sensor control technology to collect necessary data from shop floor
- Robot technology for automation





- Market leading manufacturers of software and devices as well as system integrators, who are strong in their respective fields
- Collaborate to provide the most optimal and appropriate e-F@ctory architecture, as a solution, to end-users.

Member Companies

About **640** companies

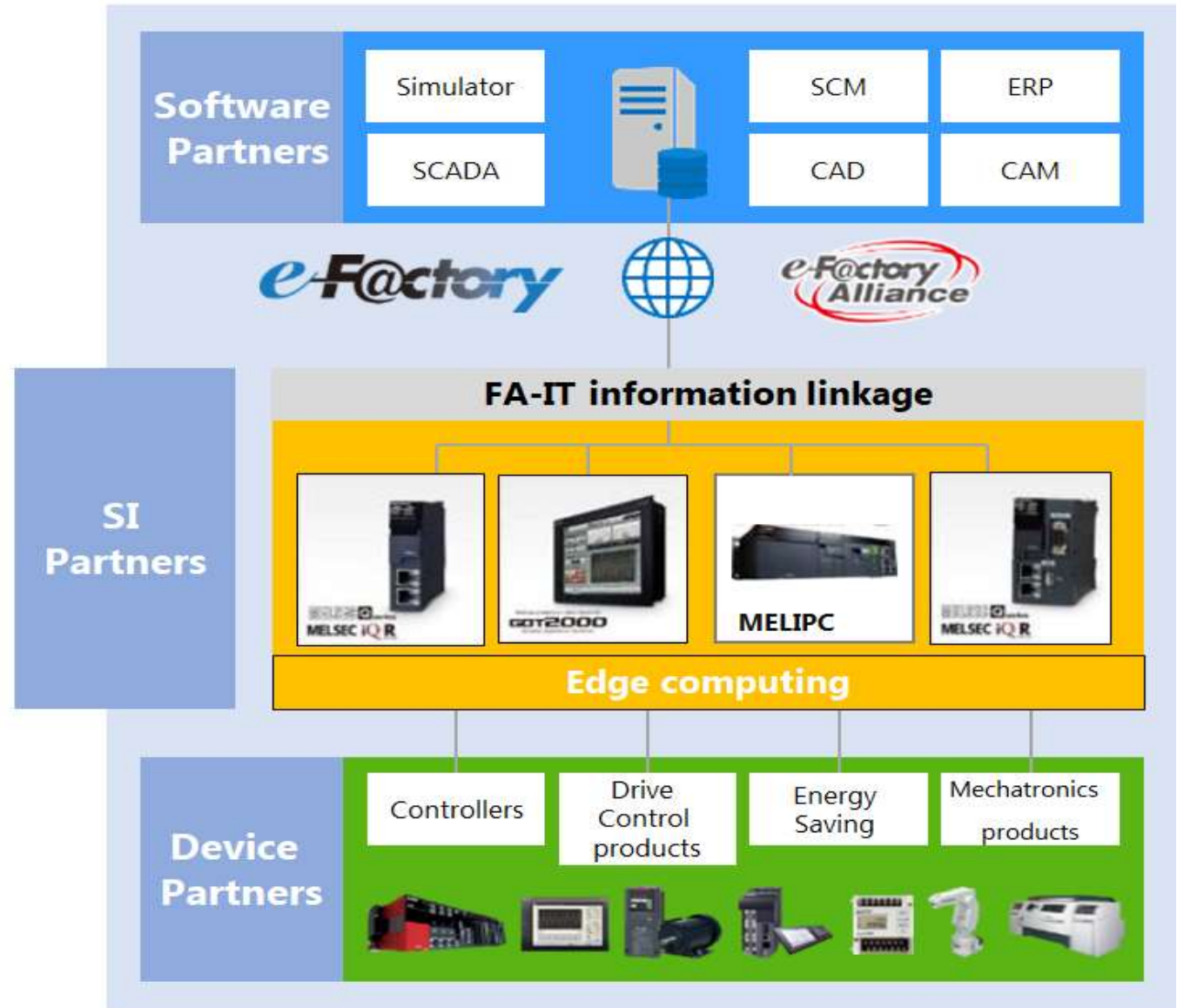
- **Software Partners** (170 companies)
- **SI Partners** (315 companies)
- **Device Partners** (155 companies)

The number of system installation

More than **10,000** systems

Main Industries:

Automotive, Semiconductor, Electronics, Food & Beverage, Metal etc..)





- Market leading manufacturers of software and devices as well as system integrators, who are strong in their respective fields
- Collaborate to provide the most optimal and appropriate e-F@ctory architecture, as a solution, to end-users.

Member Companies

About **21+** companies

- **Software Partners** (**11+** companies)
- **SI Partners** (**7+** companies)
- **Device Partners** (**3+** companies)

The number of system installation*

More than **50** systems

Main Industries:
**Automotive, Pharma, Food & Beverage,
Packaging etc..**

* **Completed or in Proposal Stage**



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Edge Computing Platform



EDGE CROSS

Common requirements of manufacturing

Collecting and analyzing data easily

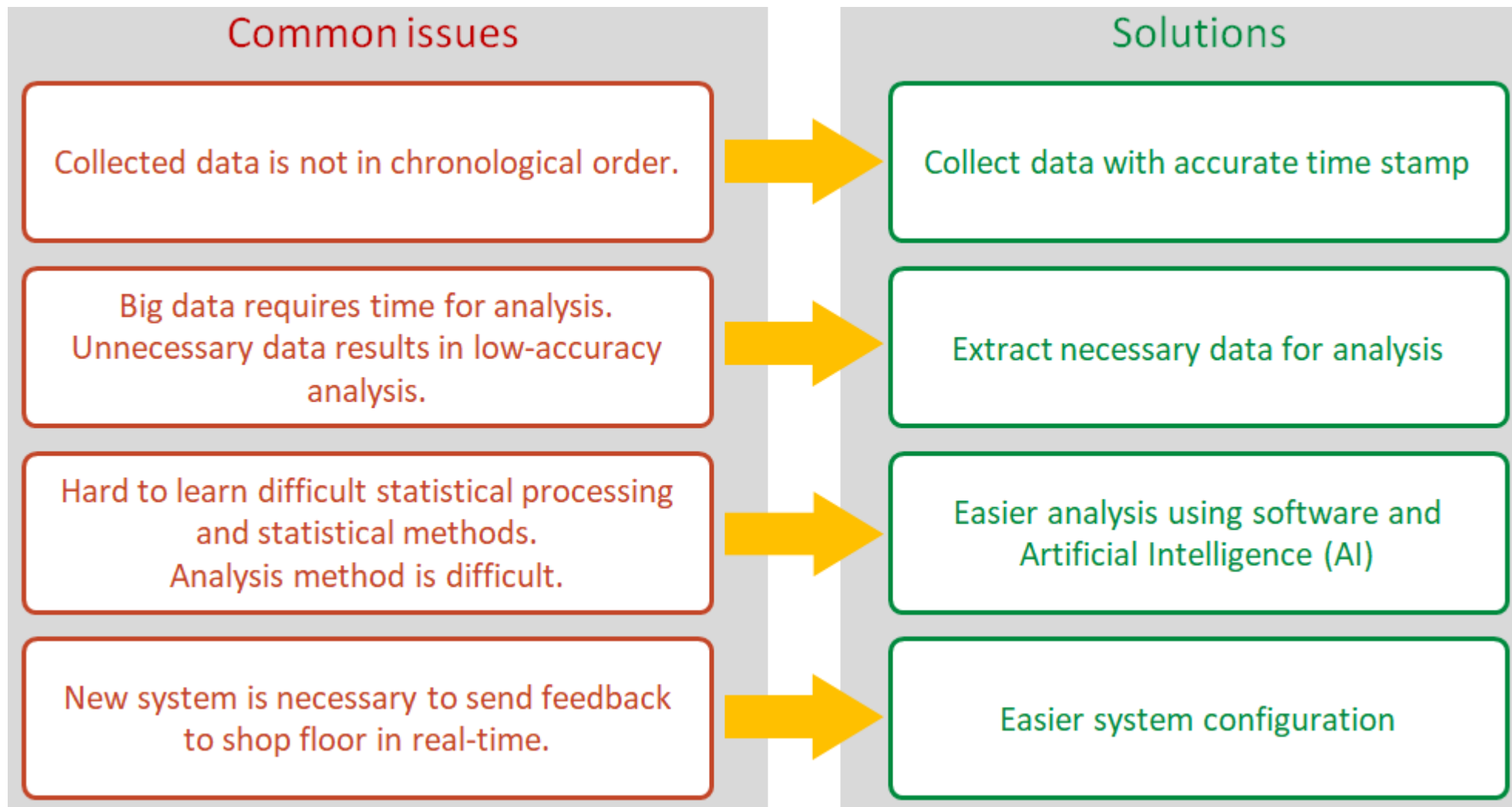
Realizing preventive maintenance of production



Reducing defective products

Improving production by utilizing big data and IoT technology

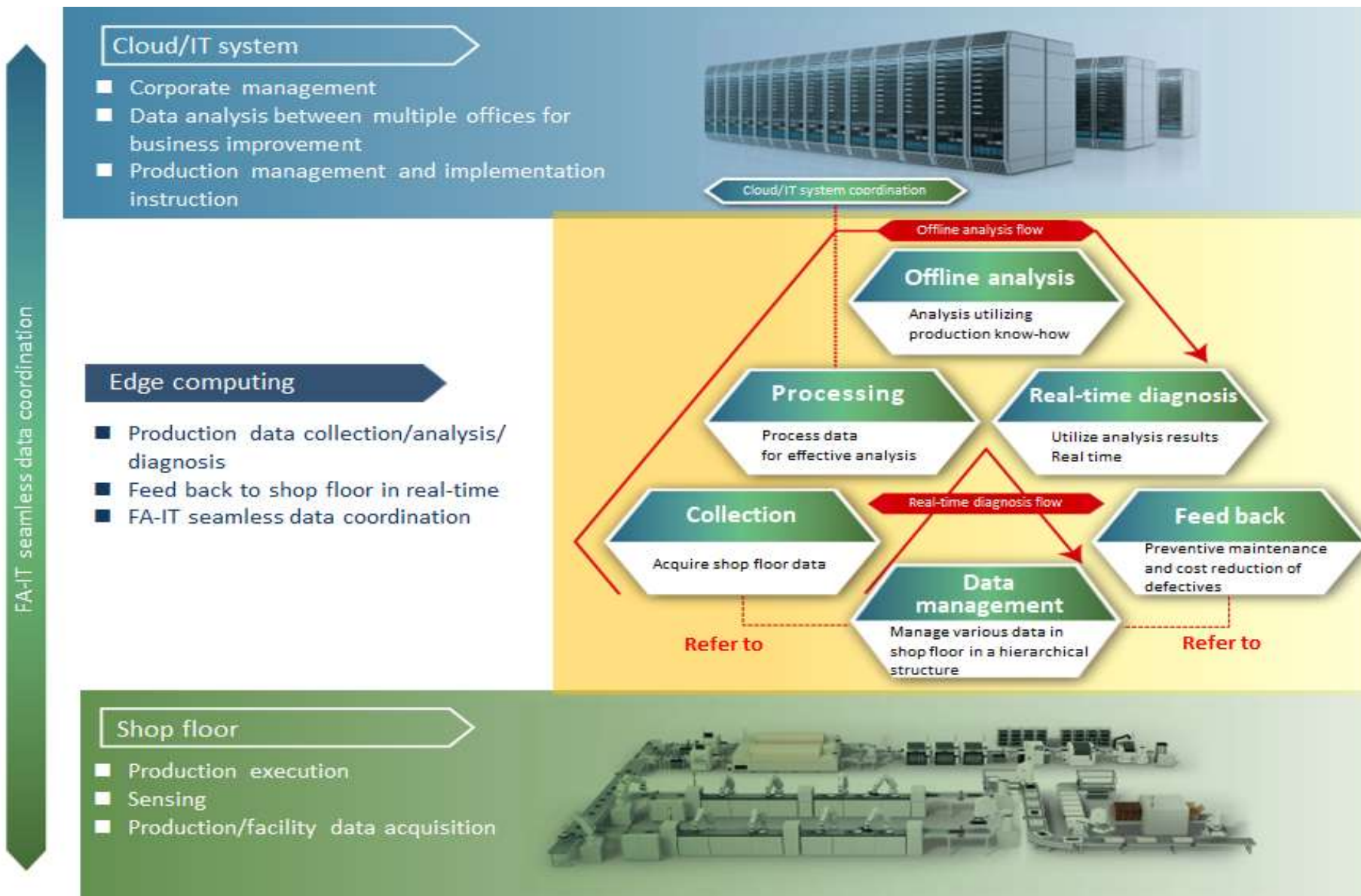
Preventive maintenance and quality improvement



Edge computing can realize all

Edge-computing

Enables data collection/analysis/diagnosis/feedback in shop floor, realizing quality improvement by preventive maintenance with real-time diagnosis.

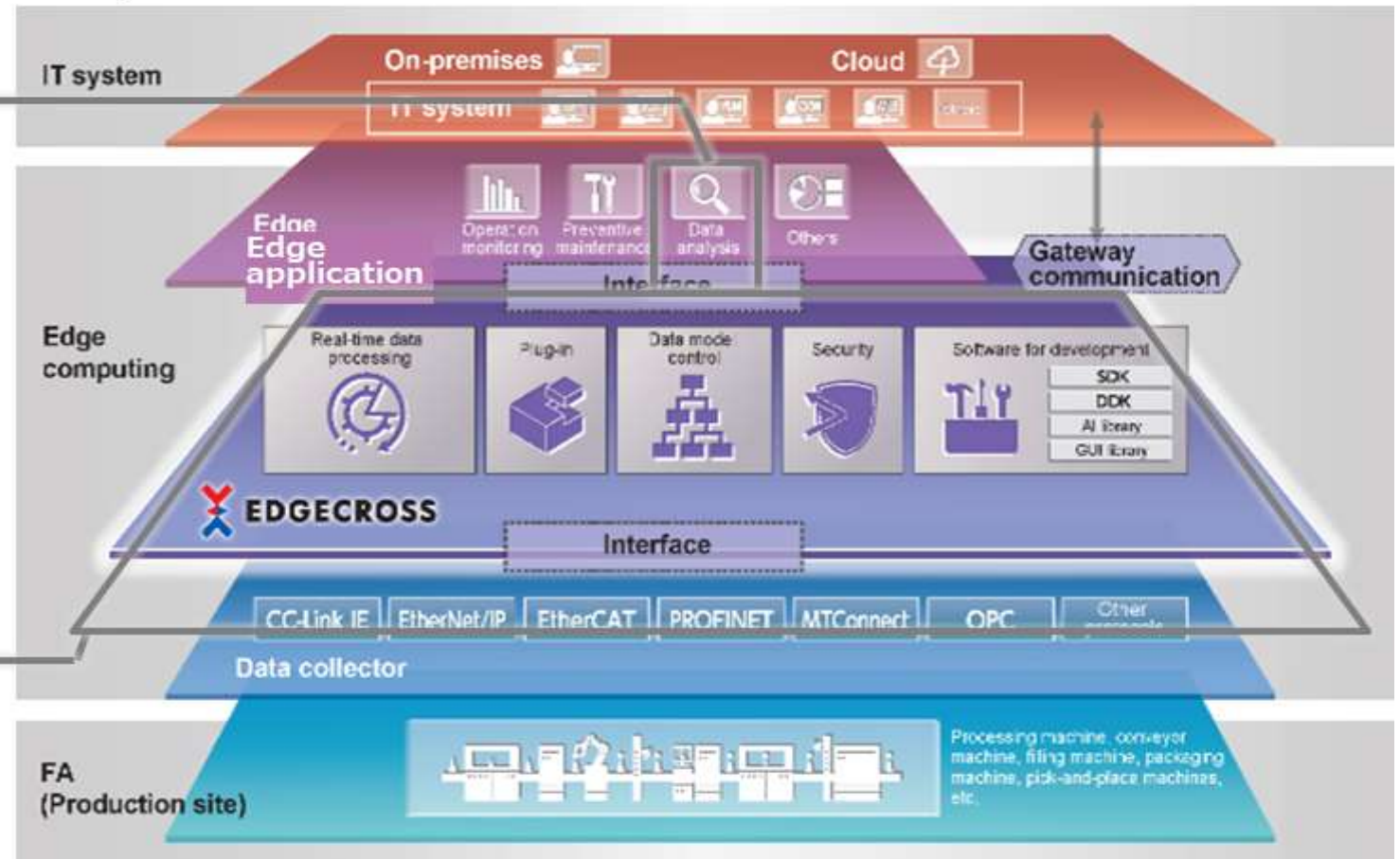


Edge-computing Software and Products

Now developing data analysis and diagnostics software, supervisory control and data acquisition (SCADA) software, and industrial-use computers as the products for Edge-computing. Solutions will support the Edgexcross open-software platform

Released in the spring of 2018

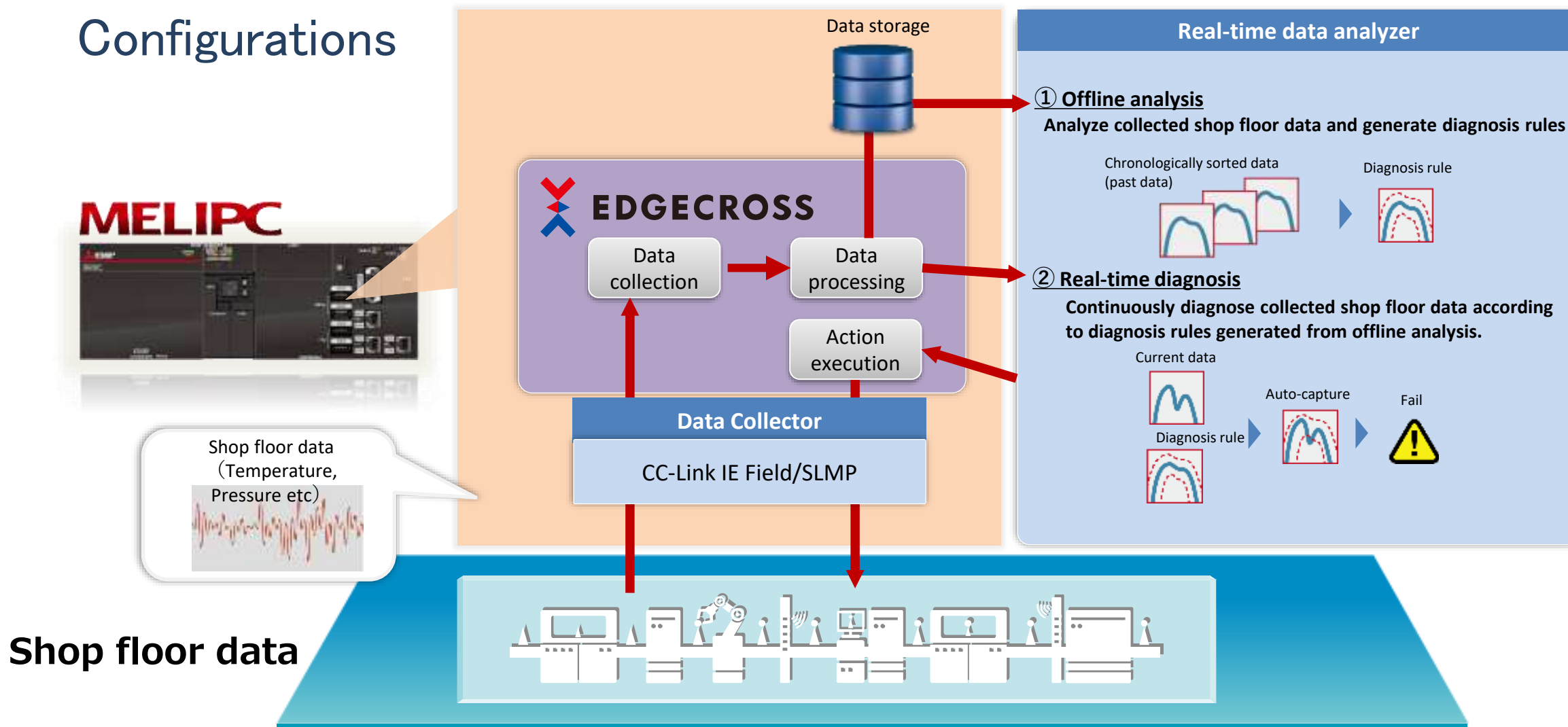
EdgeCross supported



MELIPC : Platform or IPC that Edge Applications run on.

Real-time data analyzer : Analyze and diagnose the data collected by EdgeCross.

Configurations



Product features

1. Real-time diagnosis

Real-time feedbacks of detected fails according to the result of diagnoses the shop floor data.
 ※Usual software for analytics has only offline-analysis function.

2. AI Maisart*

Mitsubishi AI function are able to diagnose based on learned matter from passed data.

* AI Brand name of Mitsubishi Electric. Function features are high-efficiency learning and high-speed analysis.
 Abbreviation of "Mitsubishi Electric's AI creates the State-of-the-ART in technology"

3. Various algorithm of analytics

Realize the preventive maintenance and quality control using analytics, diagnose, and other various statistical method. (Over ten methods)

Similar waveform recognition



Guard-band monitoring

SPC

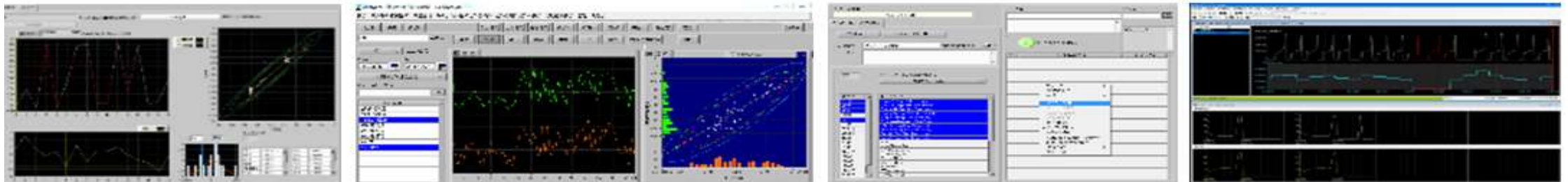
Multiple linear regression analysis

Mahalanobis-Taguchi system

Correlation analysis, Main component analysis, Hotelling's T2, KNN, Partial least square, etc..

4. Easy to operate and display using GUI

Easy to realize the data diagnose using AI or statistical methods without programming.
 Easy to display and check the result of analytics.



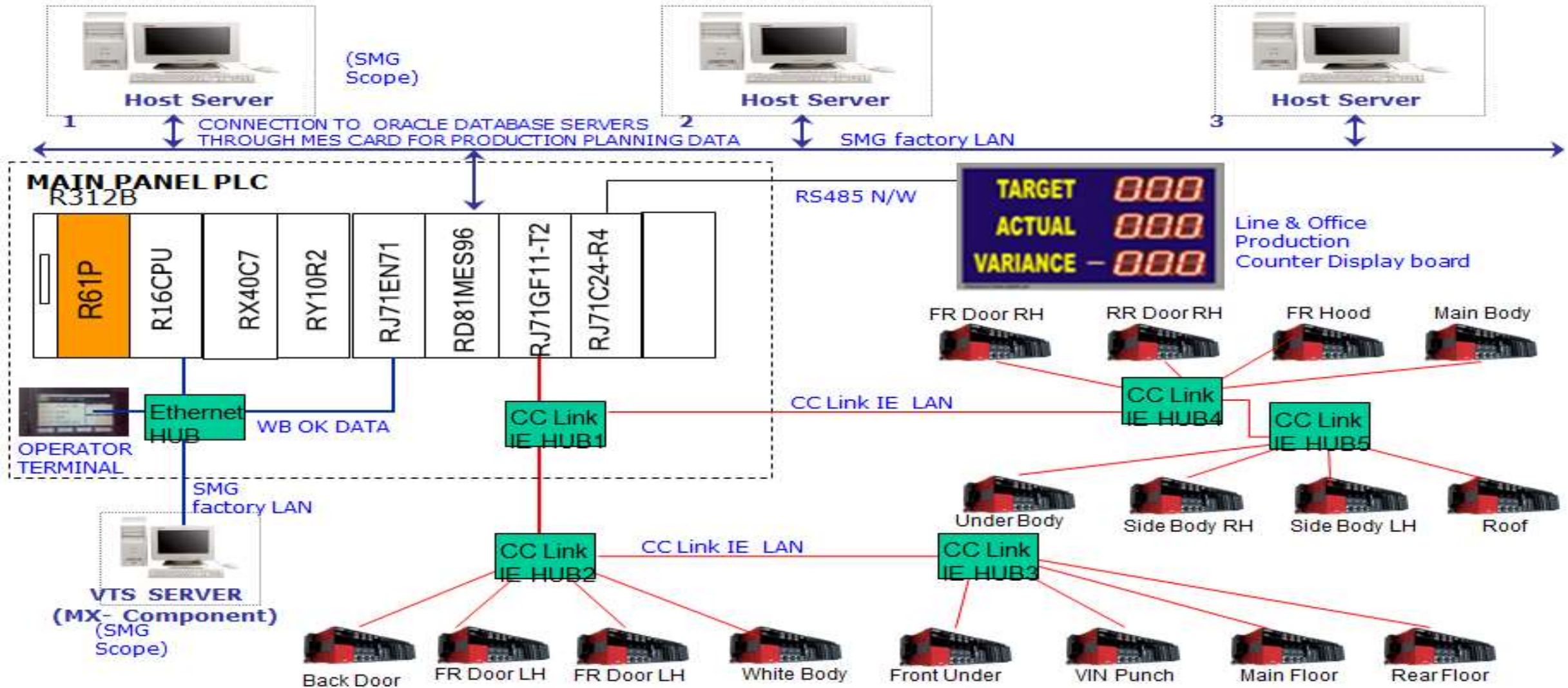
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Case Studies

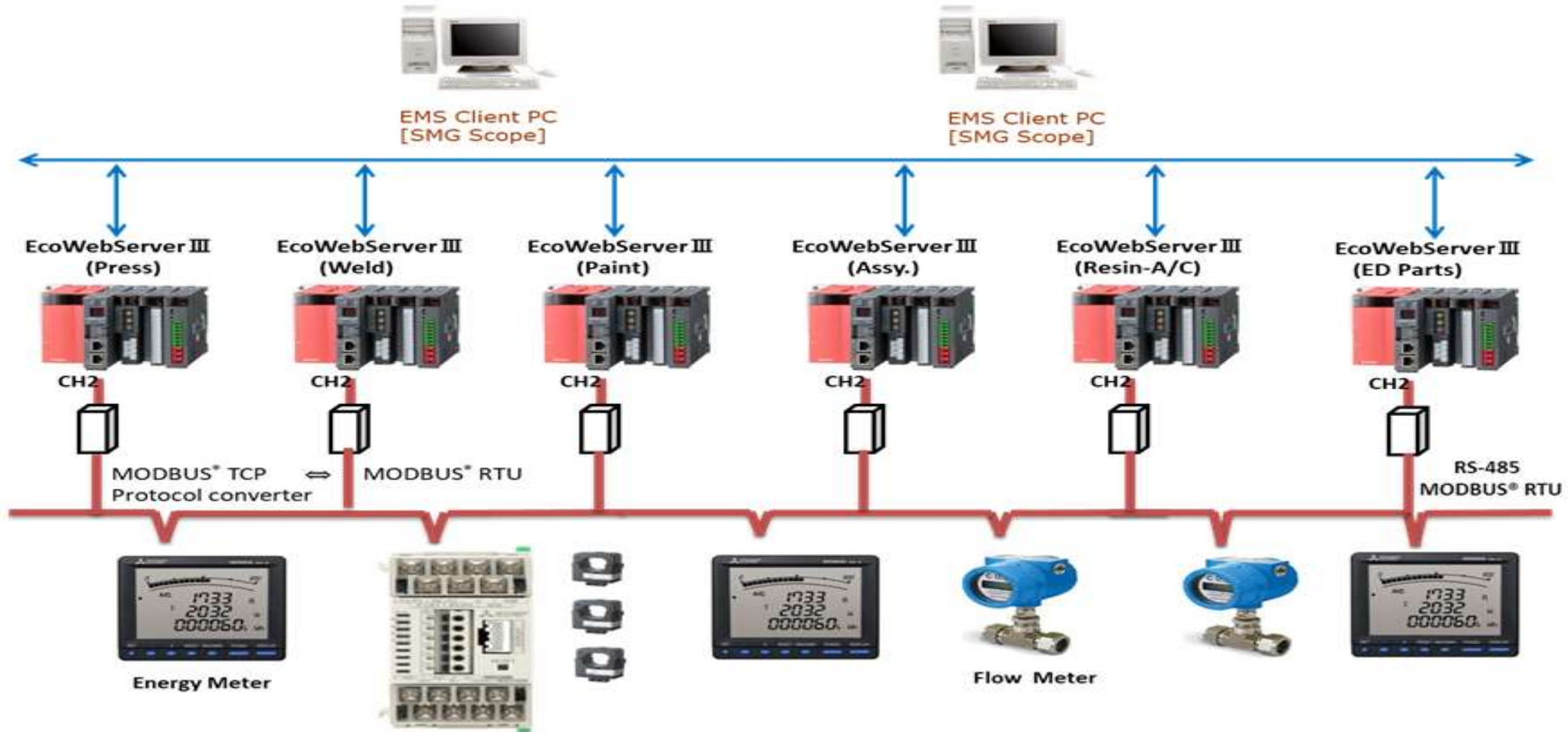
e-Factory



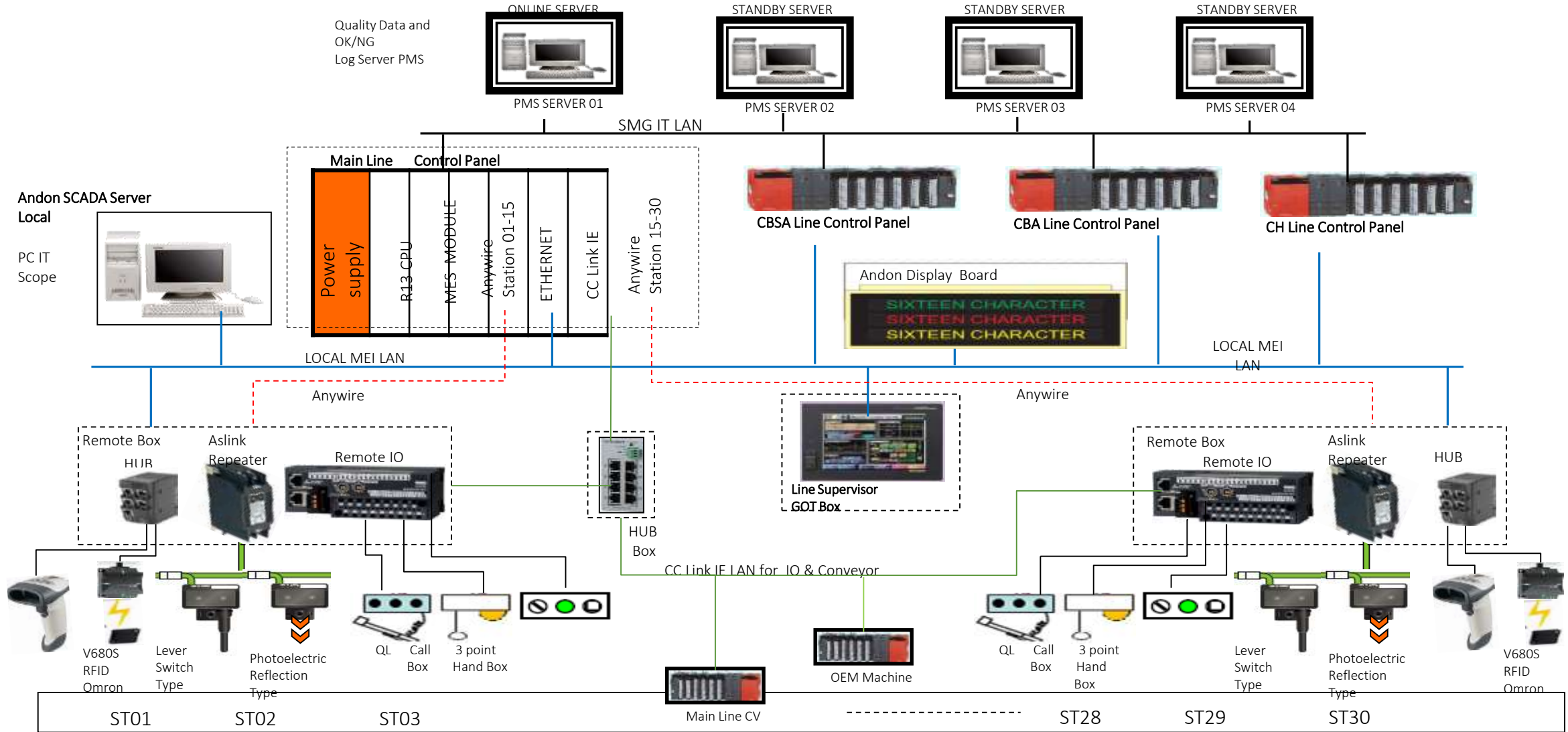
Weld Shop Production Control System for Leading Auto Manufacturer



Energy Management System for Leading Auto Manufacturer

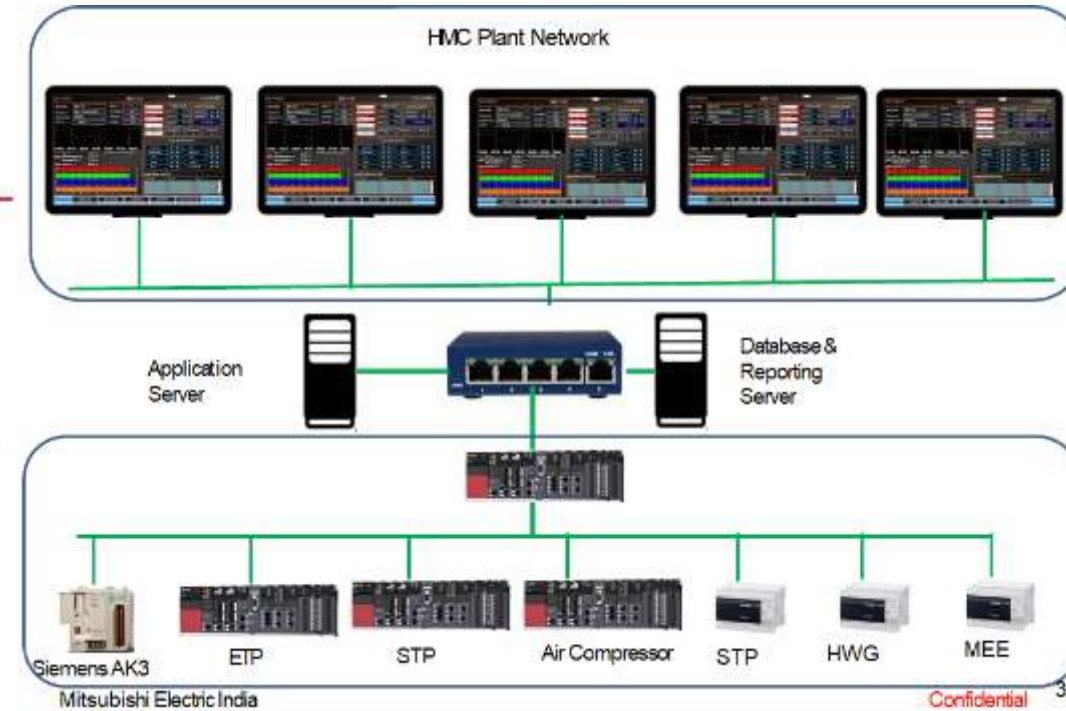
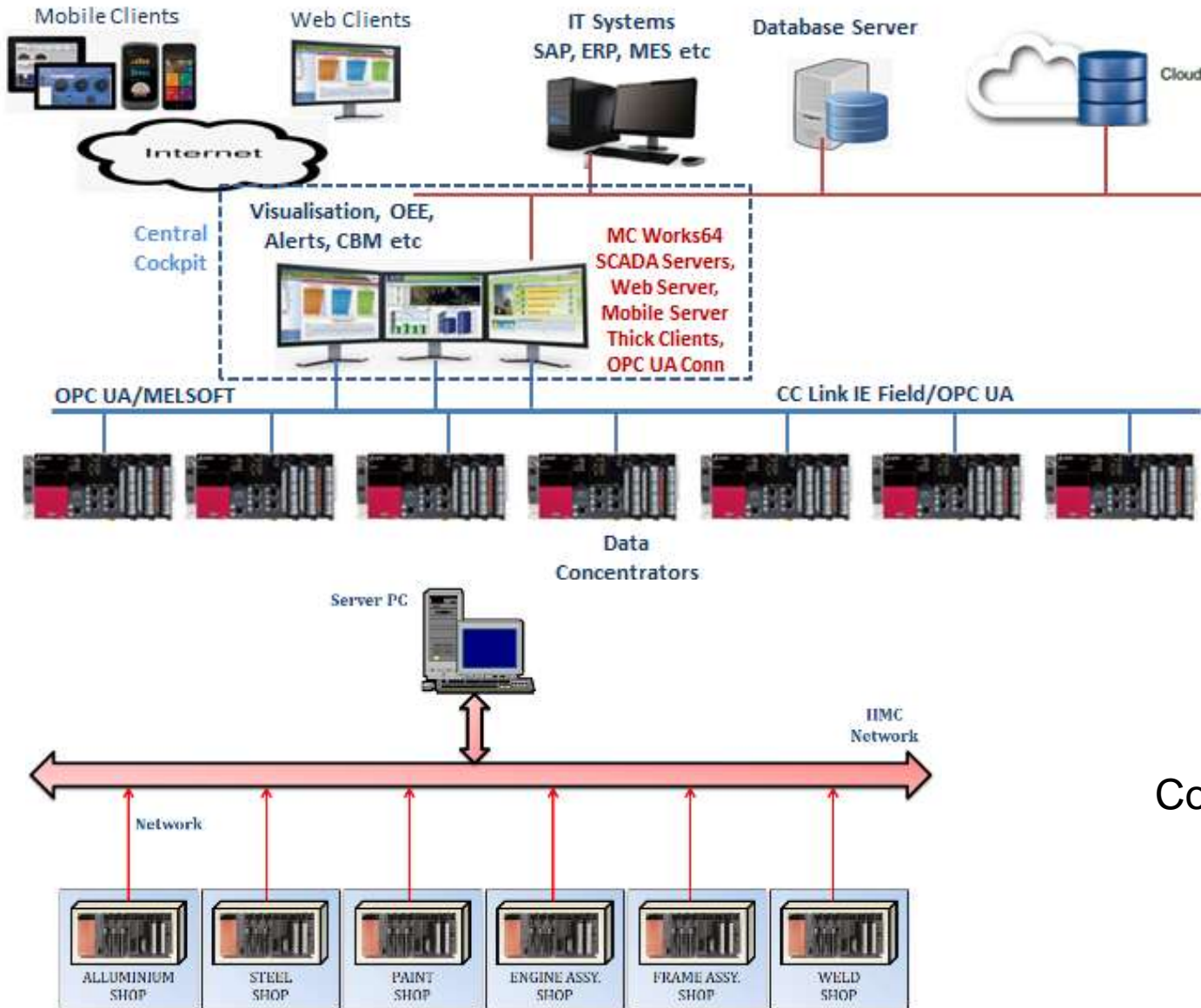


Traceability System for Leading Auto Manufacturer



Case Study 4

Digitization of Leading 2 Wheeler Manufacturer



Confidential 3

Complete New Plant Digitization through ME hardware and CC Link IE & OPC UA

Conveyor Automation Solution for 2 Wheeler Assembly

