

DX Digital
Transformation

e-F@ctory

Accelerating the Transformation of Manufacturing

Mitsubishi Electric Factory Automation (Thailand) Co., Ltd.

- e-F@ctory Concept & Open Platform
- Edge Computing
- Project Implementation

About the 'Mitsubishi family' and Mitsubishi Electric

623

Mitsubishi companies
(as of March 2018: www.Mitsubishi.com)

(Independent operations started in 1946)

**Mitsubishi Heavy
Industries, Ltd.**



**Mitsubishi Motors
Corporation**



**Mitsubishi Electric
Corporation**



**Mitsubishi
Corporation**



**MUFG
Bank, Ltd**



**Nikon
Corporation**



**Tokyo Marine &
Nichido Fire Insurance
Co., Ltd.**



**Kirin Brewery
Co., Ltd.**

Mitsubishi Electric Profile

Corporate Mission

The Mitsubishi Electric Group will continually improve its technologies and services by applying creativity to all aspects of its business.

By doing so, we enhance the quality of life in our society.

A wide-variety of business areas, from household goods to space



FY2020 Mitsubishi Electric's 100th Anniversary



Products and Solutions

Edge Computing Products

- Industrial Computer MELIPC
- Edge Computing Software



Controllers

- Programmable Controllers MELSEC
- Computerized Numerical Controllers(CNCs)



Drive Products

- AC Servos-MELSERVO
- Inverters-FREQROL



Visualization

- Human-Machine Interfaces(HMIs)-GOT
- SCADA MC Works



Industrial Robots

- Industrial Robots-MELFA



iQ-Platform

iQ Platform

FA Integrated Engineering Software
MELSOFT iQ Works



DX Digital
Transformation

e-F@ctory

01

e-F@ctory Concept & Open Platform

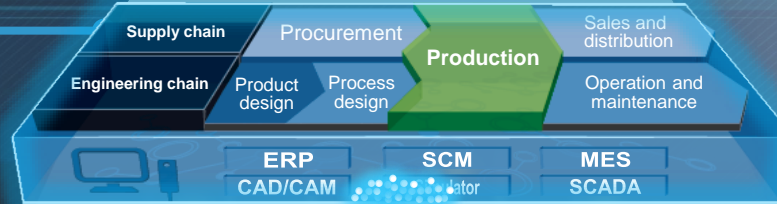
e-Factory

Announced in 2003

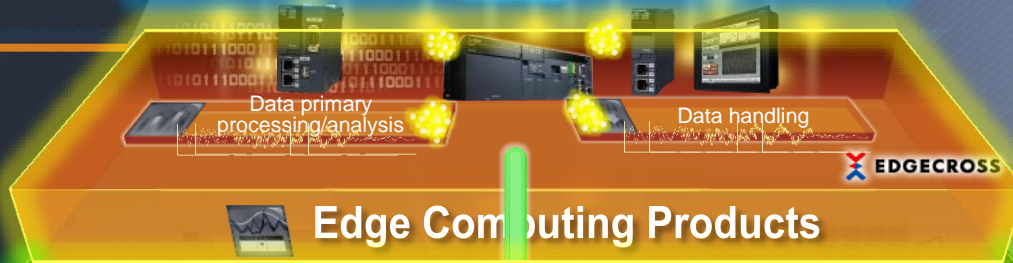
FT-IT Integrated Solutions

“Connect Everything”

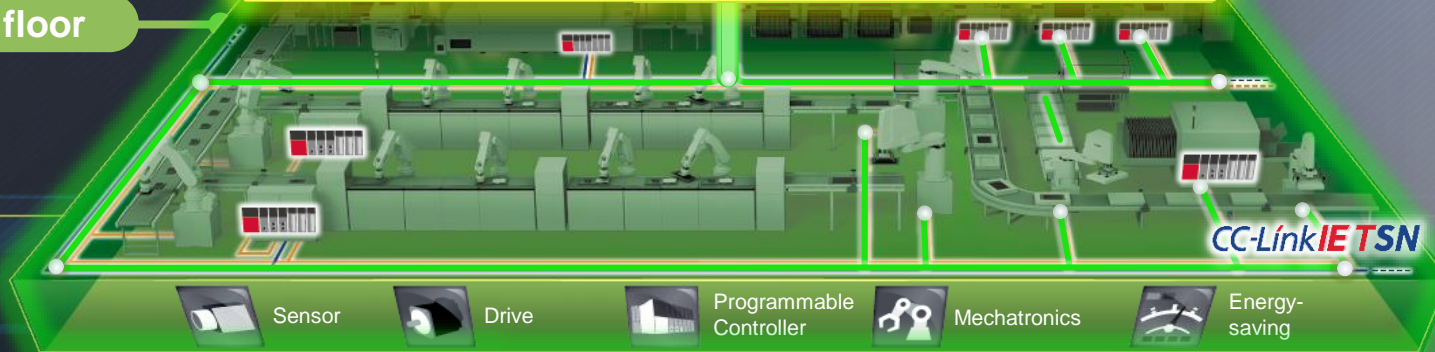
IT system



Edge-computing



Shop floor



Productivity

Quality

Sustainability

Safety

Security

Improve

- Real-time diagnostic results are fed back to the production site in the edge layer
- Offline analysis results from the IT system are fed back to the production site

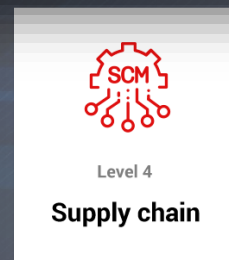
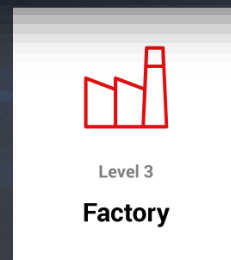
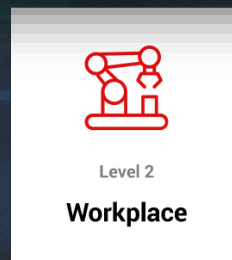
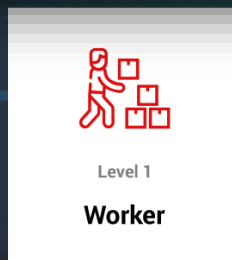
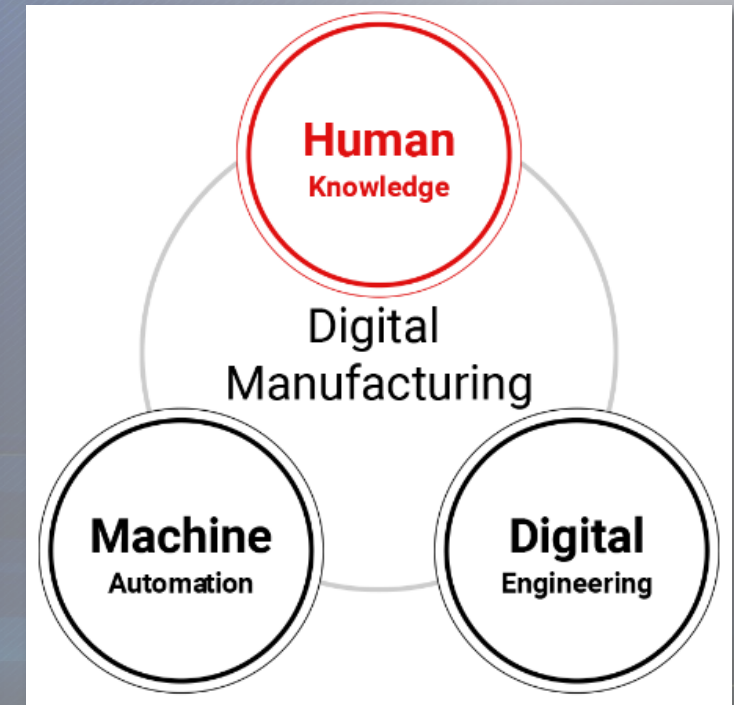
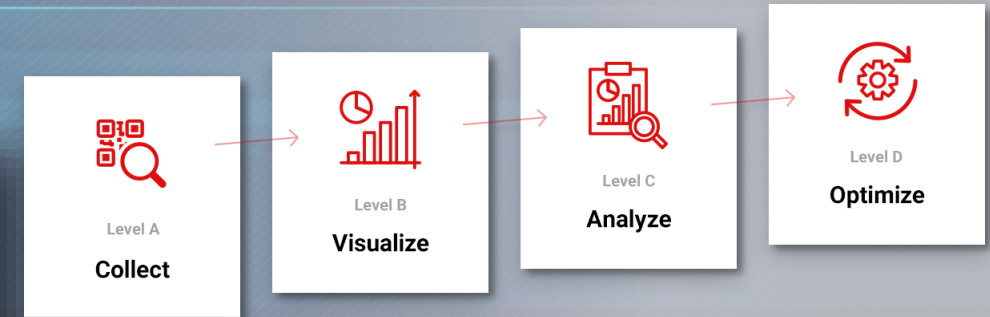
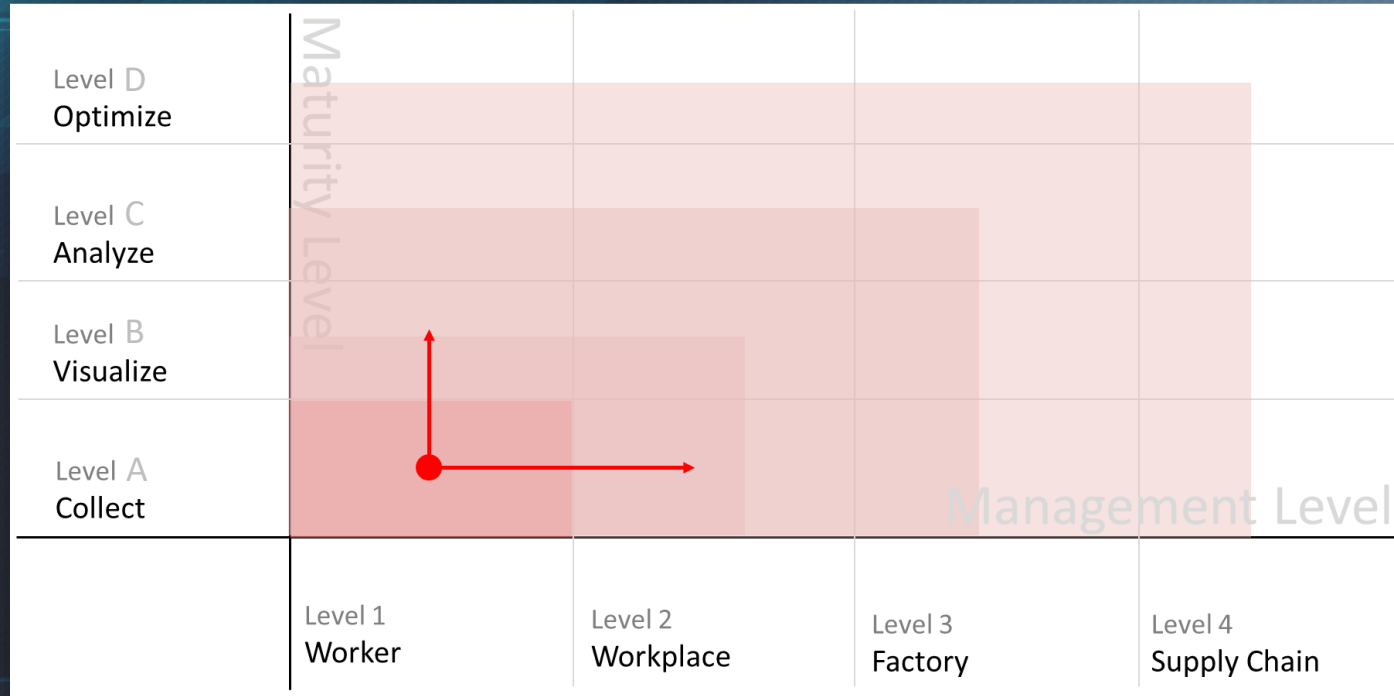
Analyze

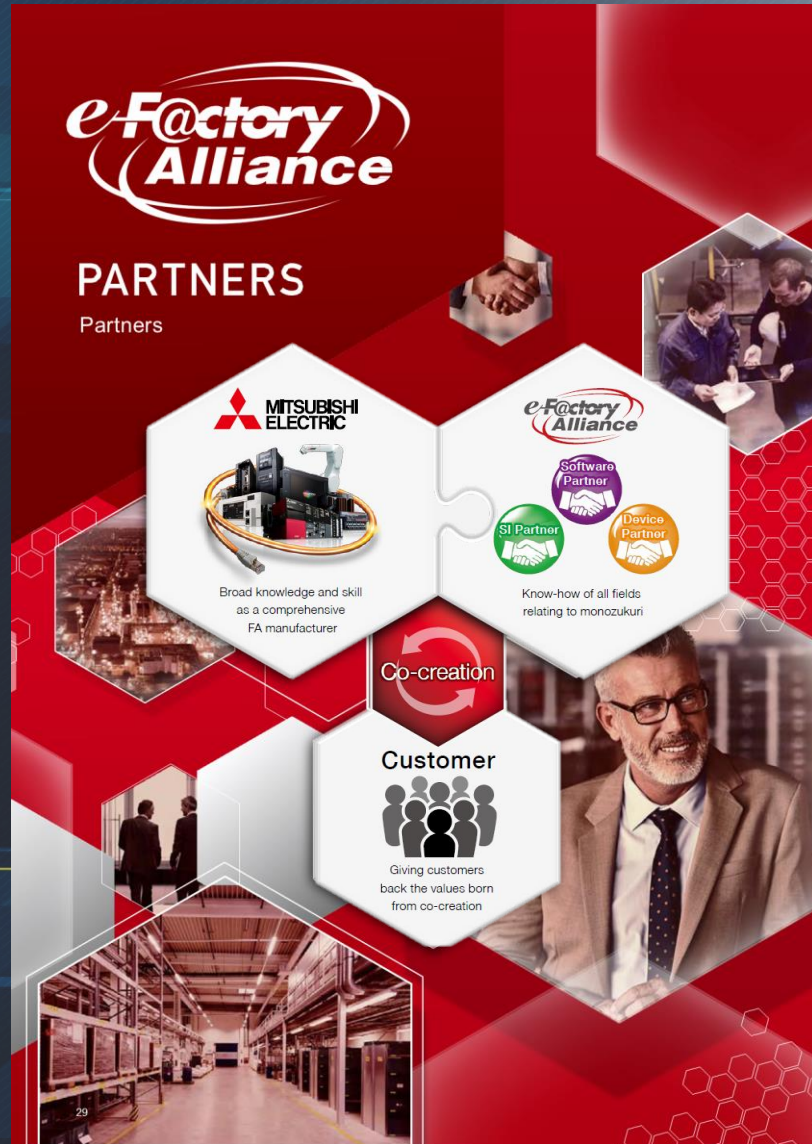
- Initial processing of data from the production site is conducted in the edge layer (real-time diagnosis)
- Meaningful data is smoothly sent to the IT layer and analyzed offline

Visualize

- Production site data is collected in real-time

Guiding you to digital manufacturing success. That is "SMKL" (Smart Manufacturing Kaizen Level).





Producing entire production systems
Achieving advanced systems integration



IT



Production shop floor



Robots



Development of application software strengthening
connection affinity with Mitsubishi FA devices



ERP/MES/SCADA



CAD/CAM/3D simulator



Data analysis



Provide device compatibility with Mitsubishi FA equipment
Achieve improved system builds and maintainability



Sensors



RFID



Related network devices



Advancing towards
new opportunities – together



e-F@ctory Alliance

e-F@ctory Ecosystem – Co-creation
with over 900 Partners*

As a solutions provider, we collaborate with many partners
across all monozukuri fields. This ecosystem provides
optimal solutions in various regions and fields in response
to the issues experienced by our customers.

*As of September 2020



Current Situation of e-F@ctory's Alliance

ECOSYSTEM

More than 58 Partners In Thailand





Automotive



Building Automation



Food & Beverage



Government & Military



Manufacturing



Oil & Gas



Materials & Mining



Pharmaceutical



Sustainability



Transportation



Utilities & Energy



Water

Collaboration with our partners
Promotes optimization of production sites dramatically.

e-F@ctory Alliance

Action Policy



Establishing a new solution! /
Technical collaboration

- Improving compatibility with Mitsubishi Electric FA products by improving ease of use and connection
- Sharing the latest technical information is possible with exchange sessions among partners/with Mitsubishi



Improving exposure! /
Promotion collaboration

- Expanding sales opportunities through introduction of partners' products in Mitsubishi Electric website, leaflets or other sales tools.
- Increasing business deal opportunities through joint promotions such as exhibitions or seminars.



Increasing orders! /
Sales collaboration

- Promoting joint proposing action in Japan and overseas (also promoting collaboration among partners)
- Expanding adoption opportunities by collaborating for proposals and acquiring orders for specific matters

DX Digital
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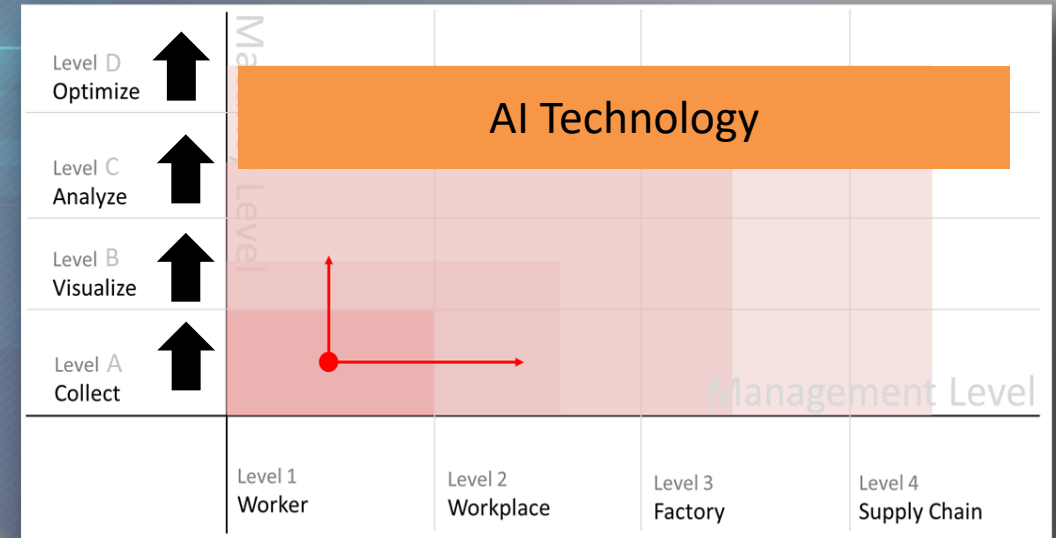
e-Factory

02

Edge Computing & Ai Technology



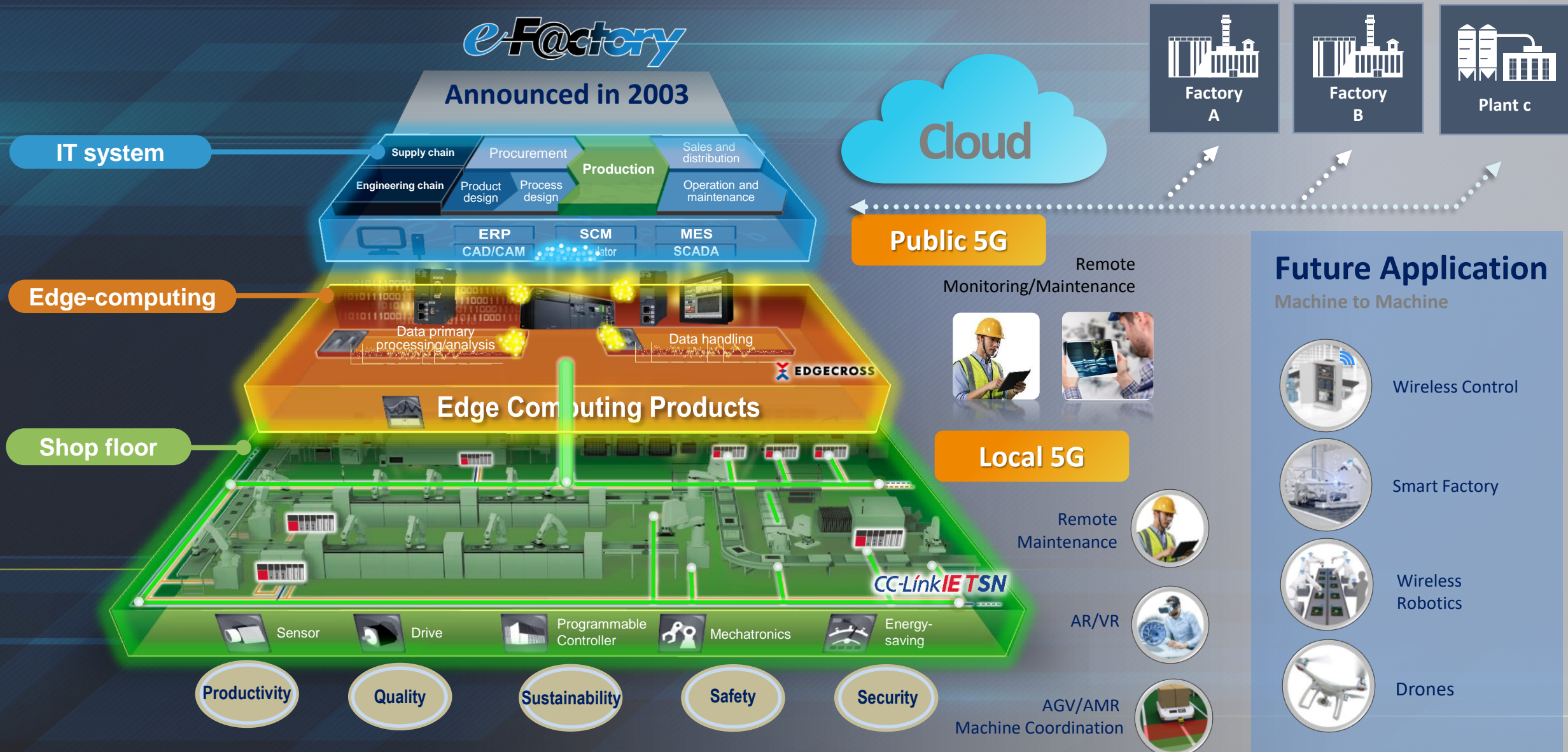
Maisart



Improve

Analyze

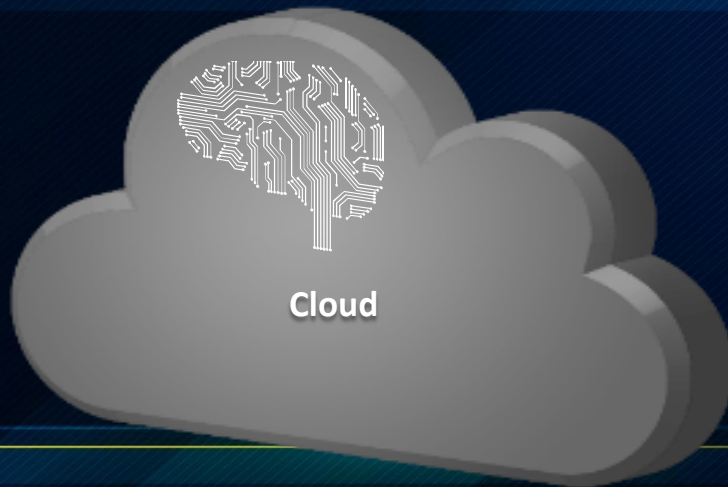
Visualize



Cloud VS Edge

Cloud

Developing knowledge



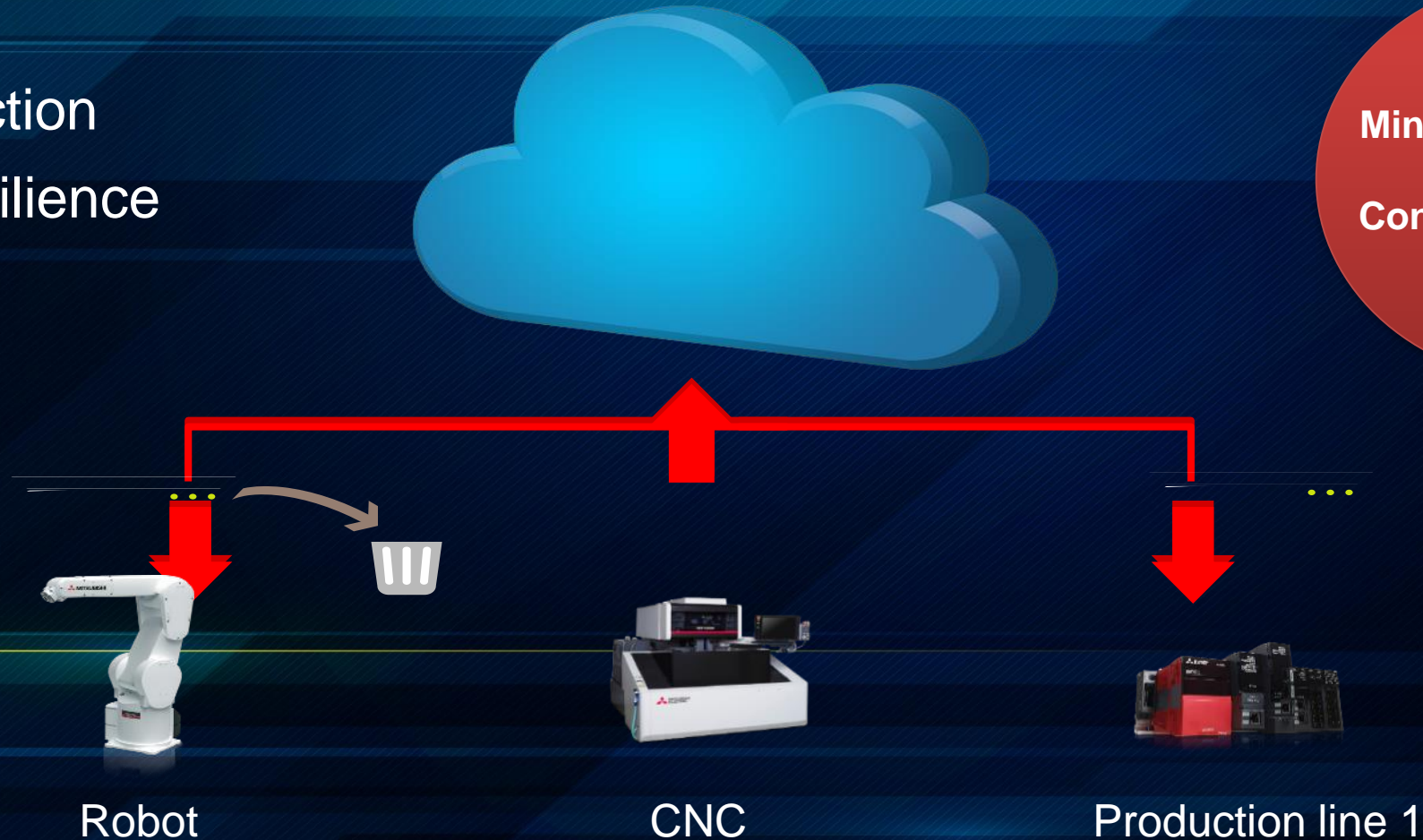
Edge

Diagnostics in action



Diagnostics on the “Edge”

- Timely reaction
- System resilience



IT Data:
Minutes. Days. Weeks

Control Process Data:
1/1,000s
1/1,000,000s



Connect everything

Real-time data analyzer

Software on Edge Computing Level



- Real-time diagnosis and offline analysis improve production in real-time

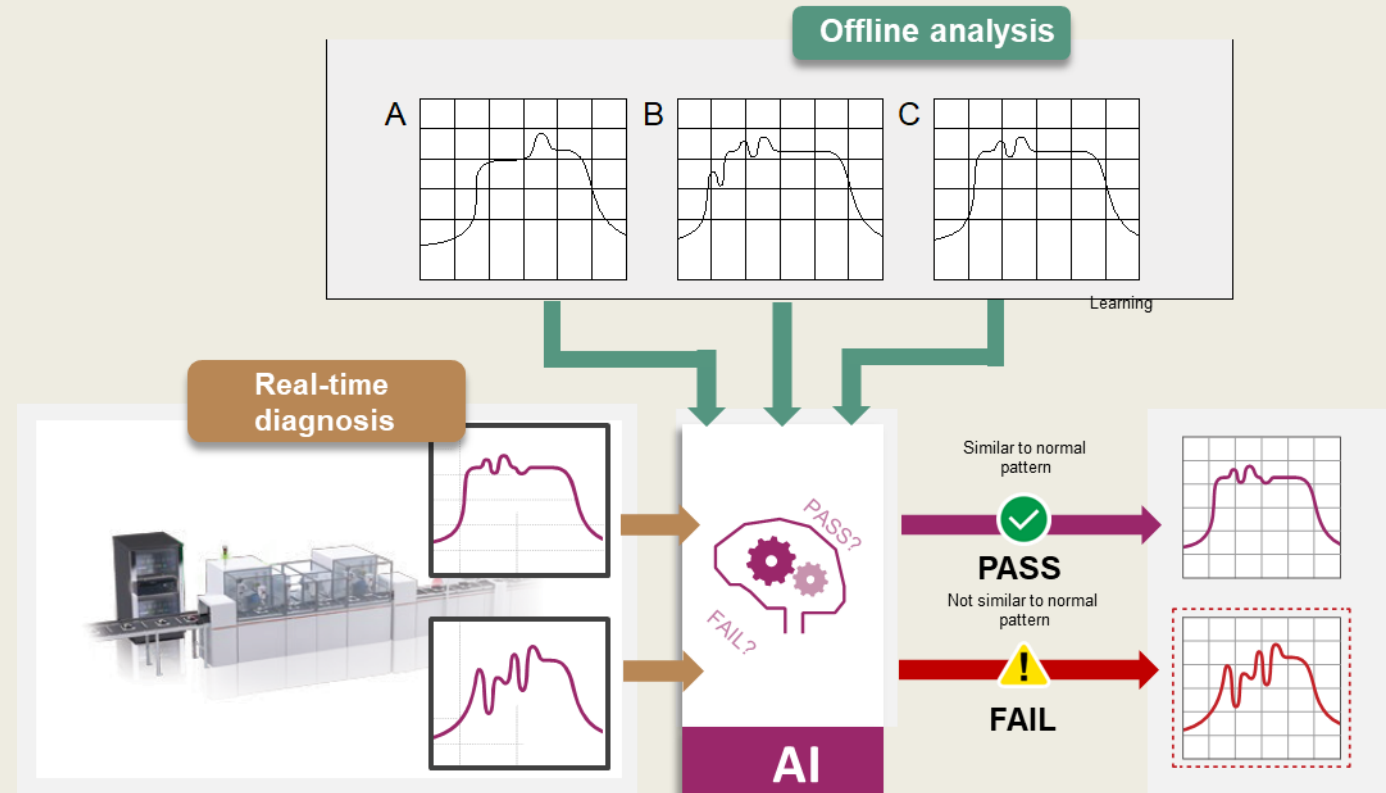
Real-time diagnosis

Continuous data is diagnosed by AI and the result is immediately returned to the shop floor machines when a sign of error developing is detected.

In addition, to realize highly-accurate real-time diagnosis, accurate diagnosis rules should be calculated by analyzing past data based on knowledge about production facilities and devices

Offline diagnosis

Realizes efficient graphic-based analysis and utilization of various analysis methods

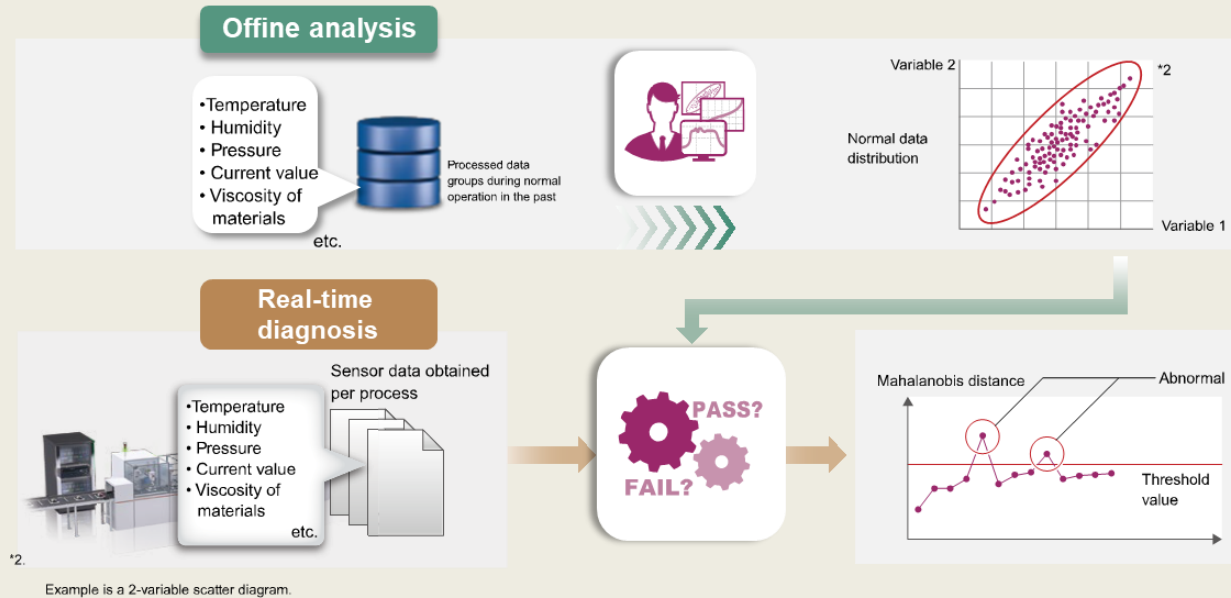


Real-time data analyzer

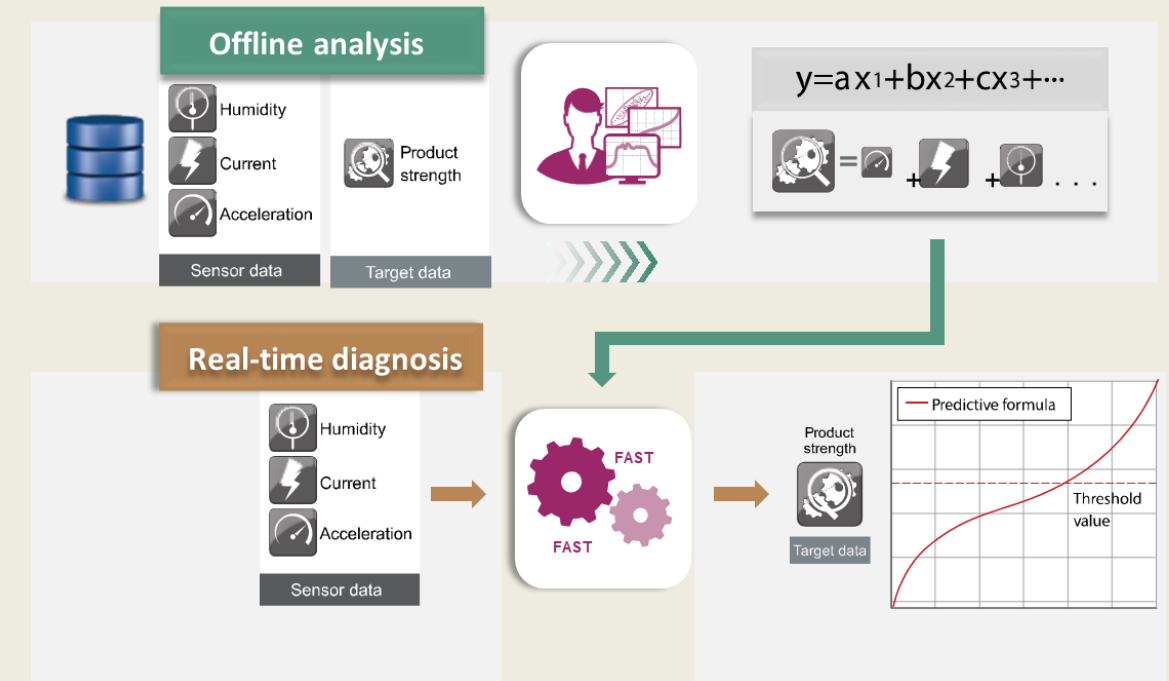
Software on Edge Computing Level



■ Detects “difference from usual” with the Mahalanobis-Taguchi system



■ Estimates “unmeasurable things” with Multiple regression analysis



Maintenance Application

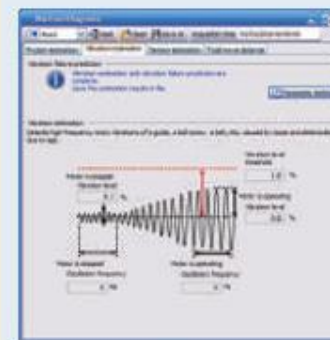
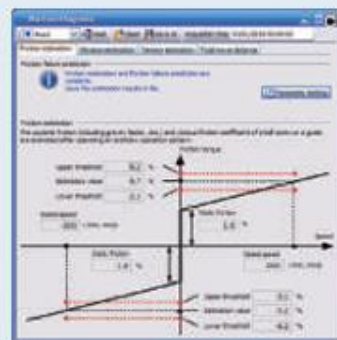
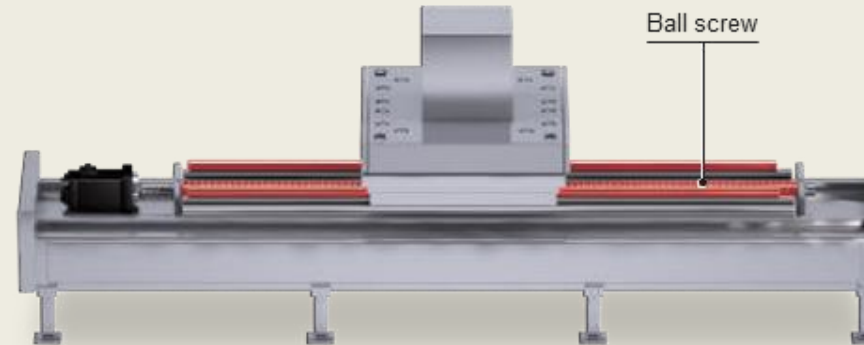
Application on FA(Shop Floor) Level



Machine Diagnosis (Ball Screws/Linear Guides)

This function supports predictive maintenance by estimating frictions and vibrations of mechanical drive components such as ball screws and linear guides.

- Friction failure prediction with the friction estimation function
- Vibration failure prediction with the vibration estimation function



SCHAEFFLER



Vibration Sensor
(Smart Check)

Maintenance Application

Application on FA(Shop Floor) Level

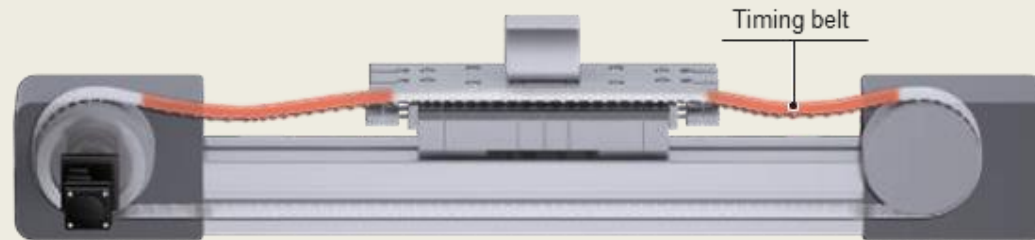


Machine Diagnosis (Belts)

NEW

This function detects aging deterioration of belts in advance by the static friction failure prediction and the tension deterioration prediction with the belt tension estimation.

- Static friction failure prediction
- Belt tension deterioration prediction



Maintenance Application

Application on FA(Shop Floor) Level

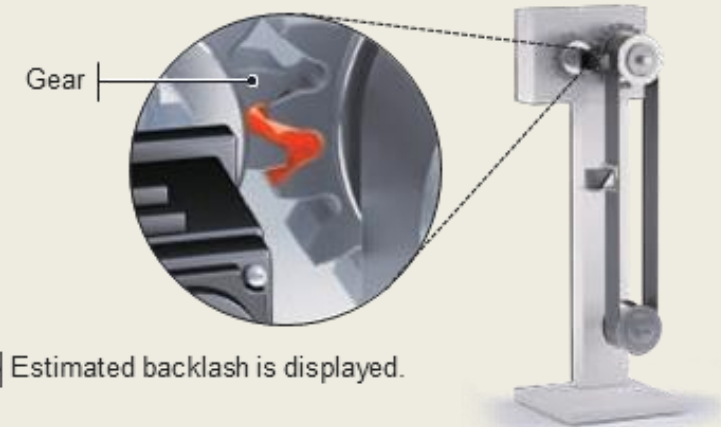


Machine Diagnosis (Gears) *¹

NEW

With this function, the servo amplifier generates commands automatically, and executes to-and-fro positioning operation to estimate the amount of gear backlash. Gear failure is predicted based on the set nominal values for backlash.

- Backlash estimation function
- Gear failure prediction



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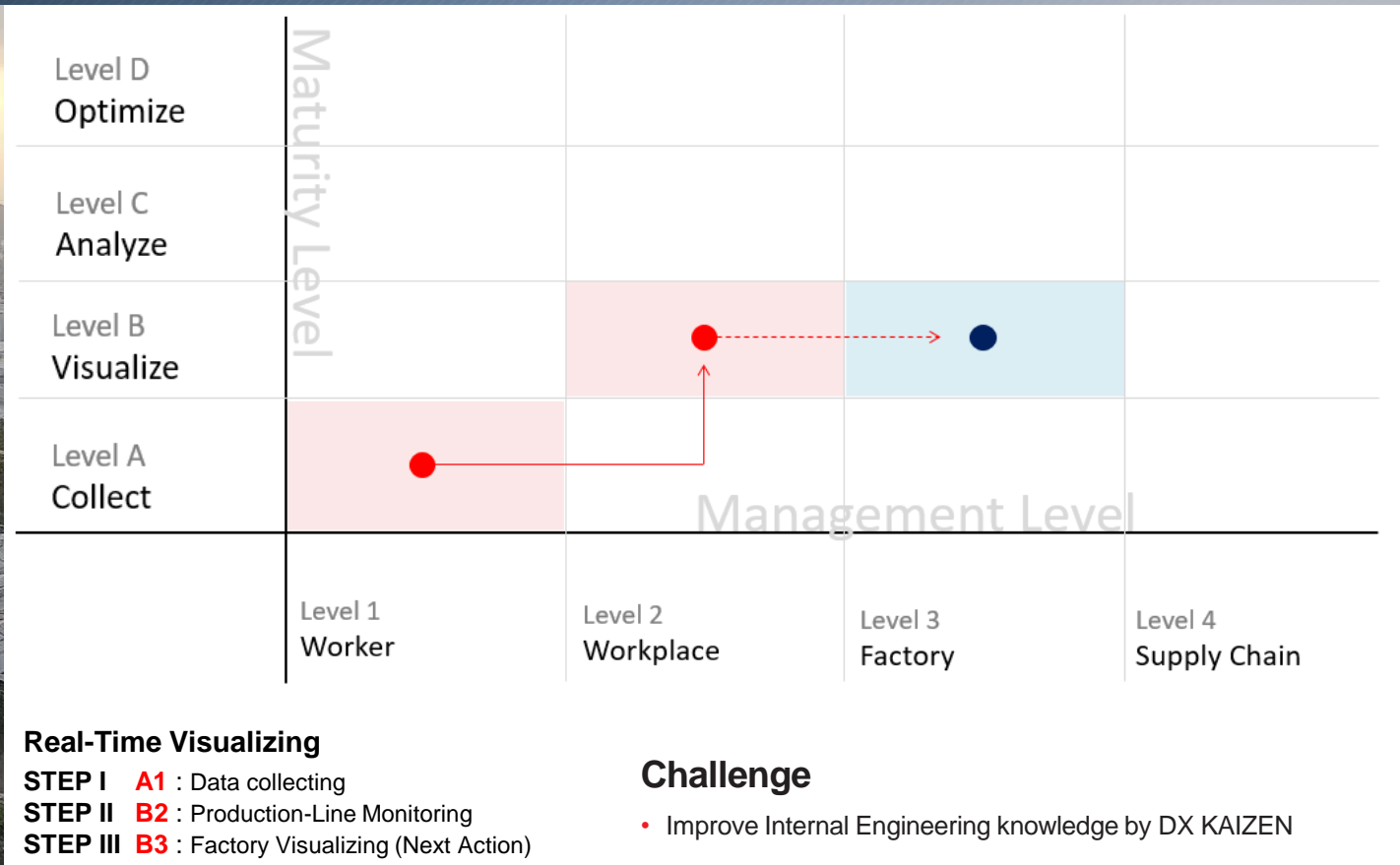
e-Factory

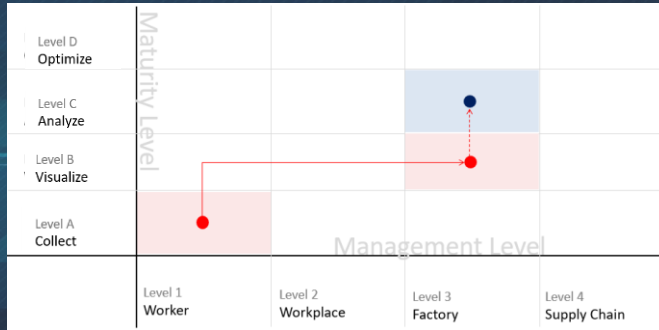
03

Project Implementations

Siam Compressor Industry

Manufacturer, Chonburi





GENESIS64™



Integrated IoT Solution

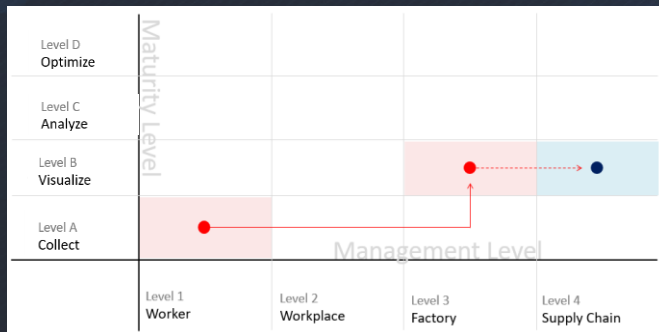
STEP I A1 : Data collecting and automation

STEP II B3 : Factory Real-Time Visualizing

STEP III C3 : Integrated ERP

e-F@ctory Alliance solution

- Integrated and Improving Machine Automation
- Developing manpower - Automation, Robot, AI, IOT (ARAI) Academy
- Integrated with IoT Solution with 5G



QUADRA TECHNOLOGY

Integrated IoT Solution

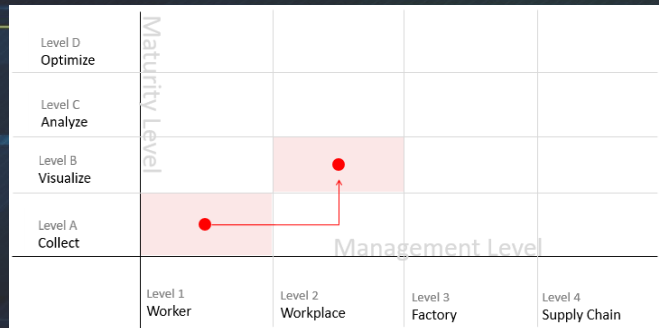
STEP I A1 : Data collecting

STEP II B3 : Factory Real-Time Visualizing

STEP III B4 : Integrated ERP

e-F@ctory Alliance solution

- Realization of data conversion and traceability
- AMR with 5G in Warehouse
- Integrated with IoT Solution with Real-Time data



FACTORIUM



Integrated IoT Solution

STEP I A1 : Data collecting from variance machine

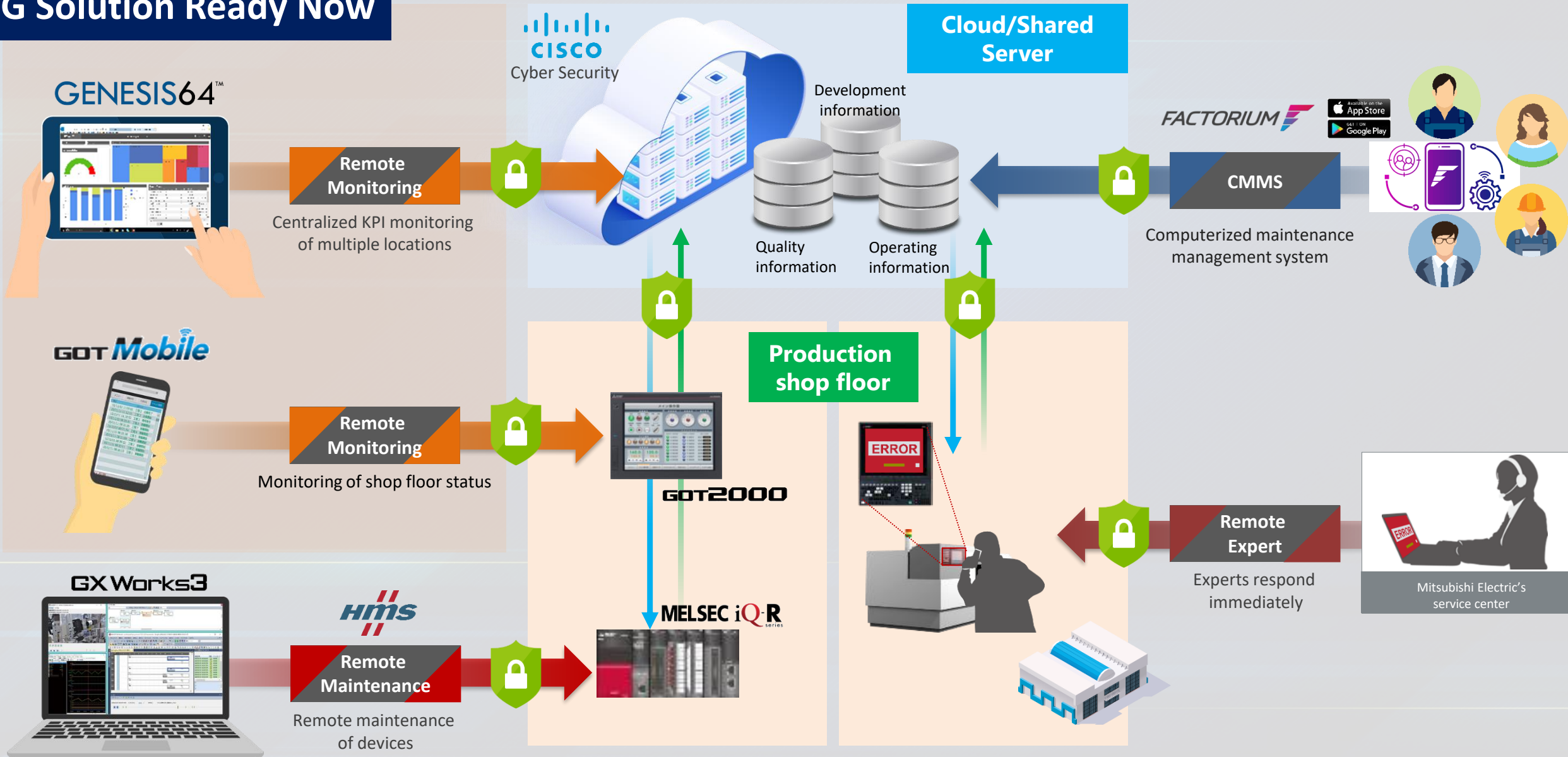
STEP II B2 : Production-Line Monitoring with CMMS

e-F@ctory Alliance solution

- Utilizing maintenance data for Predictive Maintenance
- CMMS for decrease Maintenance Operation waiting time
- Real-Time monitoring and Logging
- Can be Integrated IoT solution



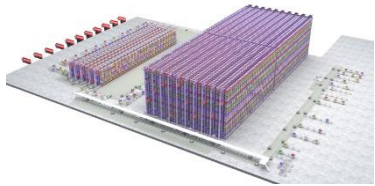
5G Solution Ready Now



Partners Solution Ready Now

AS/RS

Automated Storage and Retrieval System



DAIFUKU

IT Platform, MES/ERP

IT and OT Integration



**QUADRA
TECHNOLOGY**

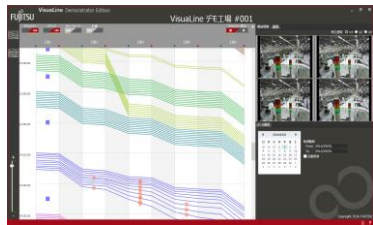
AGV/AMR

Automated guided vehicle/Autonomous Mobile Robot



AI/Data Analytics

Specific AI Solution



FUJITSU

Predictive Maintenance

Improve operation and productivity



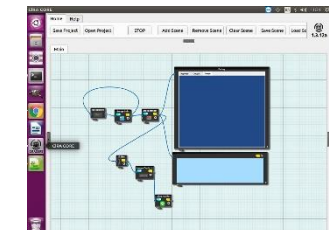
SCHAEFFLER

Cyber Security

Industrial Network and Security



CISCO



CiRA
AUTOMATION AND TECHNOLOGY



FACTORIUM

And Other in specific industry

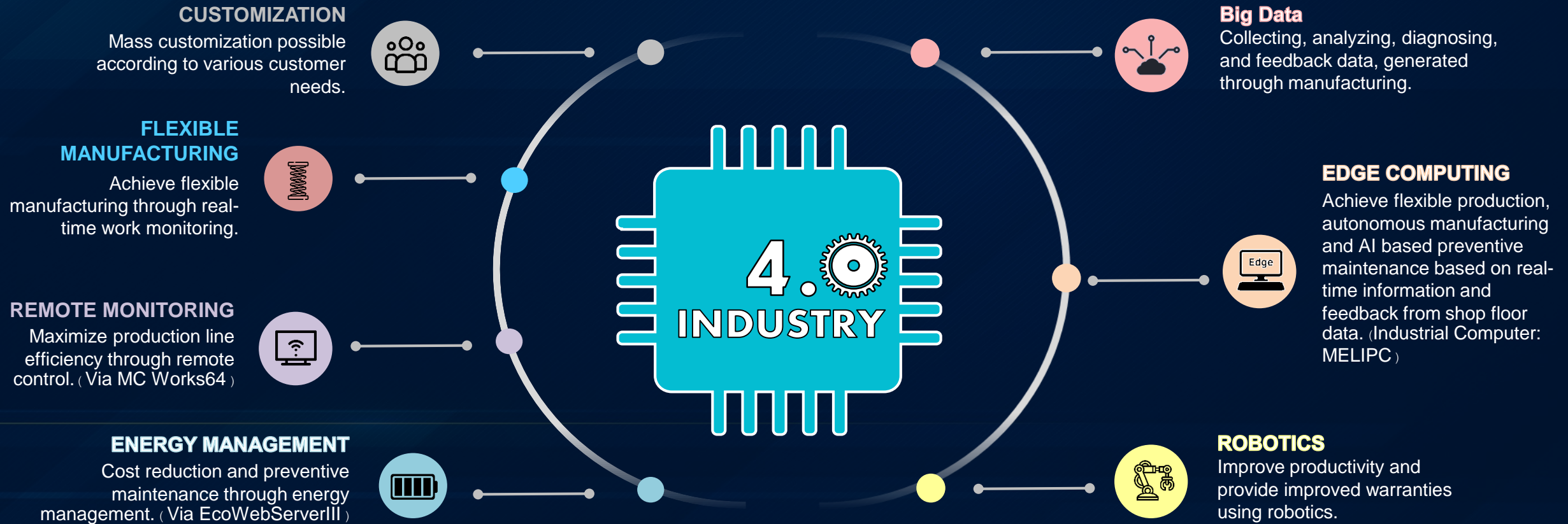
e-Factory

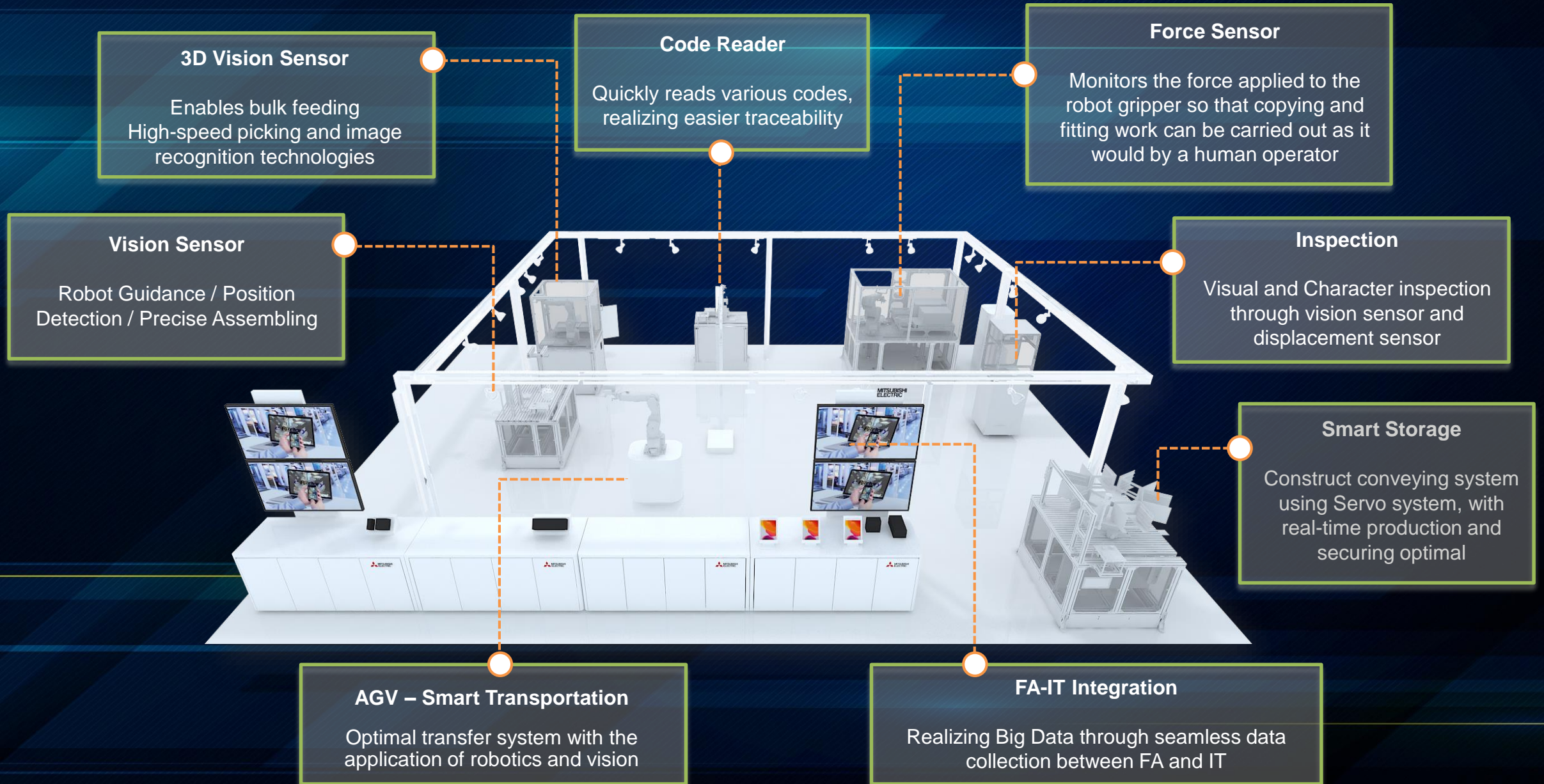
Connect everything

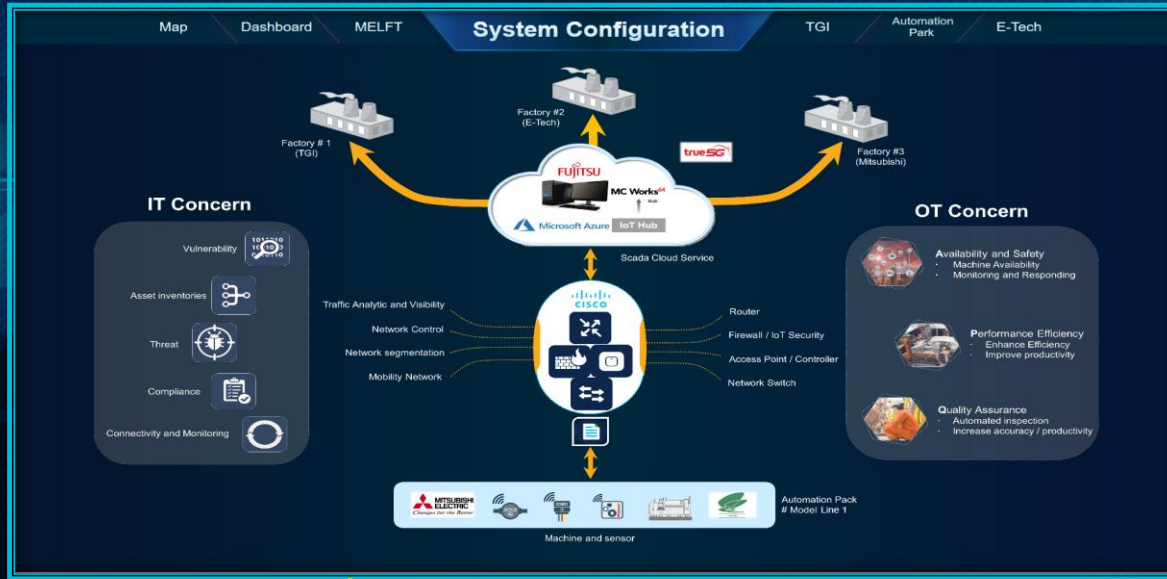
Model Line @ Automation park



Smart Factory Technologies

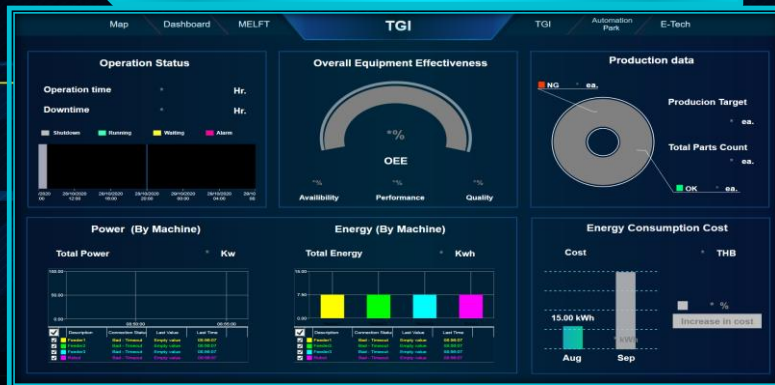




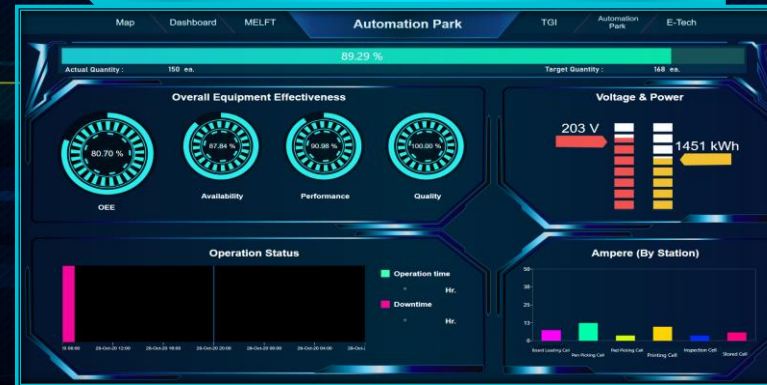


Model line of other locations
MELFT's Network

TGI : Assembly Line



Automation Park : Production Line



E-TECH : Building Automation

