

# MITSUBISHI ELECTRIC - FACTORY AUTOMATION IIoT Solutions

# WHERE WE PLAY

**FACTORY  
AUTOMATION**

**BUILDING  
SYSTEMS**

**ENERGY  
SYSTEMS**

**TRANSPOR-  
TATION**

**VISUAL  
INFORMATION**

**AIR  
CONDITIONING**

**AUTOMOTIVE  
EQUIPMENT**

**PUBLIC  
SYSTEMS**

**SPACE  
SYSTEMS**

**SEMICONDUCTOR/  
DEVICES**

**INFORMATION/  
COMMUNICATION**

**HOME  
PRODUCTS**

# AN HOLISTIC APPROACH TO FACTORY AUTOMATION

SCADA  
DCS

EDGE COMPUTING

VISUALISATION

PLC

MOTION  
CONTROL

ROBOTICS

FREQUENCY  
INVERTERS

SERVO  
SYSTEMS

SWITCHGEAR &  
BREAKERS

MECATRONICS

# CHALLENGES IN THE F&B INDUSTRY



Augmented Reality  
Pay per Product  
Zero Fault Production  
IT Security  
Big Data  
Change over Time  
Decentralized Production  
Inline Personalization  
Predictive Maintenance  
Printing Food  
Industry 4.0  
Smart Production  
Lot Size One  
Productivity & OEE  
Plug and Play line integration  
Bring your own device  
Food Safety  
Time to market  
Changeover in 1 min.



# INDUSTRY 4.0 – WE ADDRESS THIS CHALLENGE

**Mitsubishi Electric has been executing several projects in cooperation with partners and has been developing solutions on:**

- IoT
- Big Datas
- Edge computing
- Cloud Interfaces (IBM Watson, Microsoft Azure, SAP Hana)
- Simulation (Digital twins)
- Predictive maintenance
- Collaborative robots

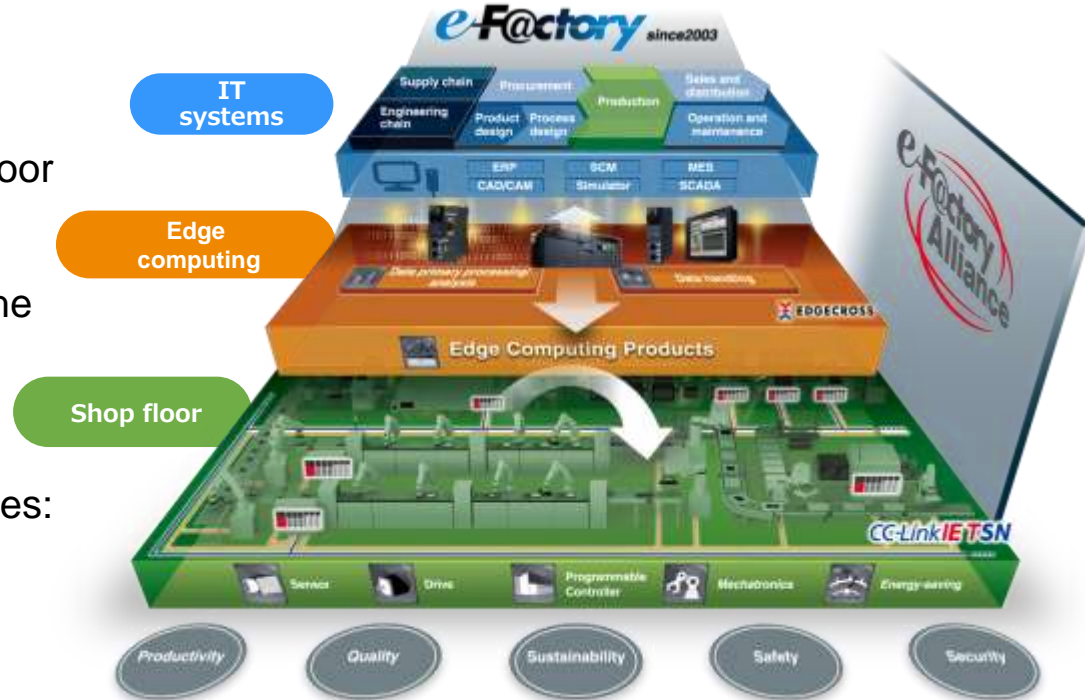




# e-Factory – Digitalization of Manufacturing

## OT-IT Integration –

Our approach to a Smart Factory/IoT based solution originates from the shop floor by combining Factory Automation (FA) and Edge systems, taking advantage of the factory skills and modern technologies to obtain improvements in the Industrial cycle phases: Design, Production, Maintenance



# Collection, processing, analysis and control of data production

## OT-IT Integration technologies

- Technologies that effectively link production levels with IT systems
- Technologies that process data in real time and turn it into useful information



Edge computing product lineup

## Control Technologies

- Technologies for the integrated control of devices and sensors, and for the collection of the necessary data from the production lines
- Robot technologies required for automation



Programmable controllers



Industrial robots

## Industrial Communication Technology

- Network technologies that efficiently collect large volumes of data from high-speed production
- Network technologies that efficiently collect large volumes of data from high-speed production

**CC-Link I E T S N**

Next-generation industrial network



# 1 - Smart Factory - Design/Engineering



## 1 Reduce engineering time

- Digital twins simulators.
- Test program changes behavior directly into simulation ambient



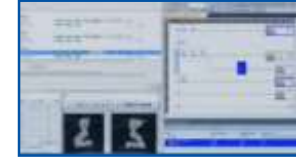
## 2 Decrease on-site commissioning timings

- Programs debugging already done partly on simulation.
- Mechanical interference among devices already tested in simulation

Simulators



Engineering tools



Coordination between simulation tools and engineering tools



# Digital twins

Cyber

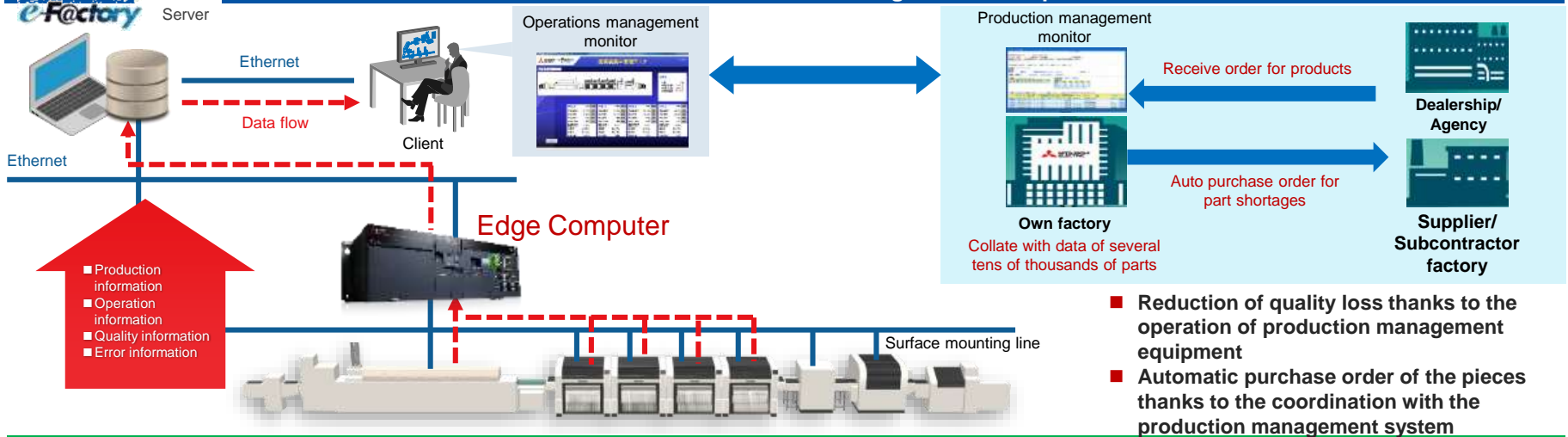


Physical

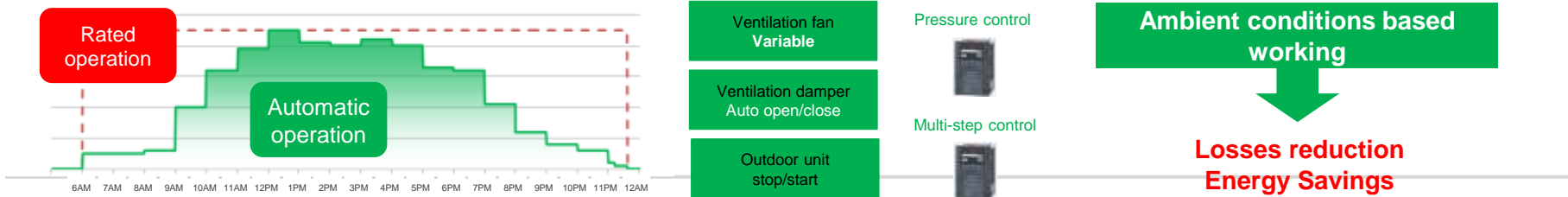


## 2 - Smart Factory - Manufacturing

### Efficient coordination between manufacturing control and production

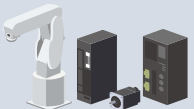




### Energy saving/utility optimization (ex: coordination with AC system)



### 3 - Smart Factory - Maintenance

The maintenance approach is to cover the «Phase» and the «Objective» of the maintenance

<b>Maintenance Phase</b>	<b>① Predictive maintenance</b>	<ul style="list-style-type: none"> <li>• Fault detection (Robots)</li> <li>• Machine diagnosis (servo amplifiers, inverters)</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor equipment operations</li> <li>• Vibration analysis (e-F@ctory support module)</li> </ul>	<ul style="list-style-type: none"> <li>• Analysis support/real-time diagnosis (Real-time data analyzer)</li> <li>• Equipment operation monitoring</li> <li>• Vibration analysis (e-F@ctory support module)</li> </ul>
	<b>② Preventive maintenance</b>	<ul style="list-style-type: none"> <li>• Maintenance simulation (Robots)</li> <li>• Life diagnosis (servo amplifiers, inverters)</li> </ul>	<ul style="list-style-type: none"> <li>• Diagnosis of rotating machine vibration</li> <li>• Diagnosis of tool wear on machine tools (iQ Monozukuri)</li> </ul>	
	<b>③ Post-incident maintenance</b>	<ul style="list-style-type: none"> <li>• System recorder – PLC based to collect the history of the variables to analyze the cause of fault</li> </ul>		
		 <p><b>Device</b></p>	 <p><b>Equipment</b></p>	 <p><b>Line/ Process</b></p>
<b>Maintenance Objective</b>				

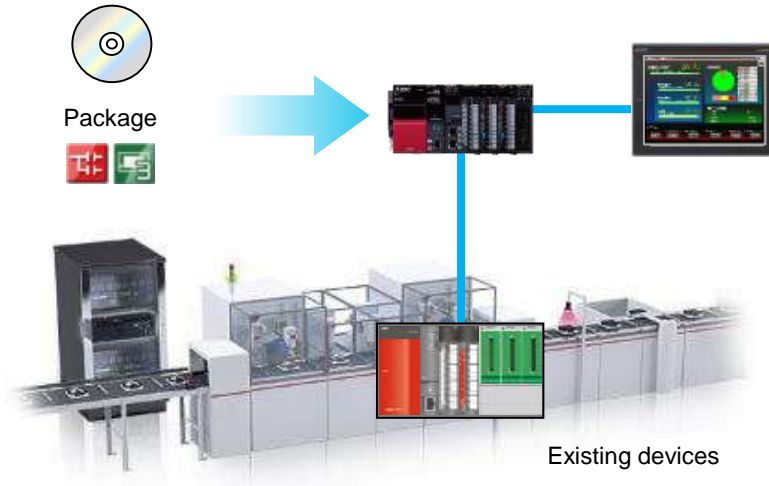
## Enabling the Smart Factory transition up to IoT level

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1. Introduce data collection solutions from the shop floor (OT Level)
2. Transform data into information with Edge computing (OT-IT Level)
3. Share and further analyze information in the Cloud (IT-Management level)



## Step 1: e-F@ctory Starter Package is one of the possible way to introduce systematic data collection on OT side, coming as a pre-configured library for quality monitoring/analysis and preventive maintenance



Quality and maintenance statistical functions can be easily integrated on existing or new production lines, achieving control on shop floor level and, at the same time, enabling data collection

### Dashboard



Displays the production and operational status of equipment such as the equipment overall efficiency and number of production comprehensively.

The status of alarms on each function screen can be monitored at once, and transition to each function is possible to check the details.


### Process capability index<sup>1)</sup> (Histogram)



This function enables real-time monitoring of the stability of production processes. Immediate improvement is possible by visually checking the distribution and monitoring alarms of process capability index.

<sup>1)</sup> Process Capability Index: An index that quantitatively evaluates the ability to manufacture products within specifications.

### Vibration analysis







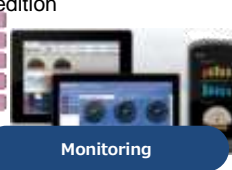

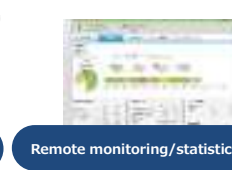
Measures vibration of equipment and devices and performs frequency analysis to quantitatively grasp the current status and detect normal and abnormal conditions.

Vibration analysis enables the location, degree, and cause of abnormalities to be estimated.


**Step 2:** MELIPC and Edge applications are helping in transforming data into information through use of AI algorithms, linking the operation to the IT level.  
MELIPC can connect directly to Cloud through OPC/UA and MQTT





**Edge applications**









<p><b>Real-time data analyzer</b></p>   <p>Analysis/diagnosis</p>	<p><b>GT Soft GOT2000</b></p>  <p>Display/control</p>	<p>MC Works64 <b>Edge computing edition</b></p>  <p>Monitoring</p>	<p>Energy-saving support application <b>Eco Adviser</b></p>  <p>Energy-saving analysis</p>	<p><b>NC Machine Tool Optimizer</b></p>  <p>Remote monitoring/statistics</p>
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**Edgexross-equipped industrial computers MELIPC series**



 <p>MI5000</p>	 <p>MI3000</p>	 <p>MI2000</p>	 <p>MI1000</p>
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## **Step 3:** Use the advanced IoT tool in our SCADA package to connect securely (TLS connection) to Cloud platforms like Azure and Amazon Web Services

-  Publish data securely to the cloud
-  Visualize on any device, anywhere
-  Remotely monitor and control assets
-  Perform analytics at the edge
-  Integrate with existing equipment
-  Store and forward historical data





LET' S CHANGE FOR THE  
**BETTER**