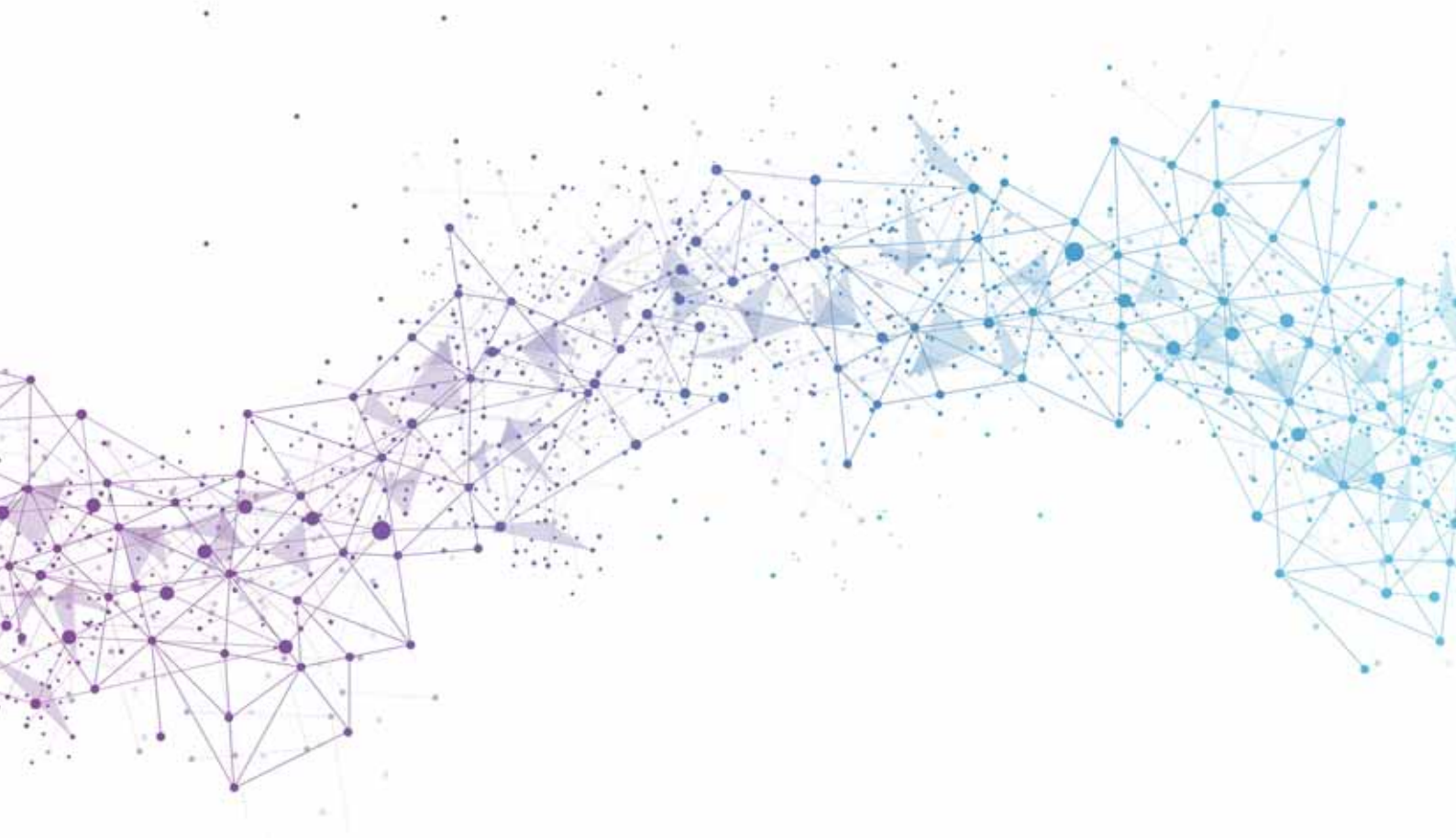
IoT / AI Solutions Catalog

SPRING 2020

YE DIGITAL



AI Artificial Intelligence

IoT Internet of Things

YE DIGITAL CORPORATION

3 strengths of YE DIGITAL's IoT solutions

IoT is expected to be utilized in various industries. We support your business by our IoT technology and rich knowledge, cultivated in the manufacturing industries since our establishment as YASKAWA Information Systems Corporation in 1978.

1 We can propose a better solution based on the rich knowledge of the manufacturing industries.

We have wide and deep knowledge of the manufacturing sites and equipments. We will work together to solve problems according to your situation.

2 One-stop service that minimizes the introduction load

We provide the one-stop solution from a small-scale startup to global deployment which can efficiently minimize introduction load.

3 Extended service

We can provide extended "beyond" system solutions such as AI analysis of accumulated data, integration with higher-level business systems, security measures, and system establishment.

We have abundant experience over 100 in many industries such as manufacturing, logistics and social infrastructure.

Satisfying results for the worksite problems

YE DIGITAL's AI Technology

Paradigm

We combined the latest AI technology with the data processing technology of FA equipment, such as the engineering data analysis technology and the image processing that we have cultivated, to support your business through the digital innovation.

Analysis algorithm that specializing in engineering service

Growing AI

- The ever-evolving AI technology is provided through our cloud service.
- Additional deep learning provides the best AI solution to you.

ONE STOP SERVICE

We provide the one-stop solution from the control software on the equipment side to the communication device, lines, cloud environments, upper applications, and security required in the IoT circumstance.

Business usage

Data accumulation on cloud

Network connection

Collected information

IoT Solutions

Failure prediction — MMPredict

AI image inspection service — MMEye

Image monitoring service — MMsmartMonitor

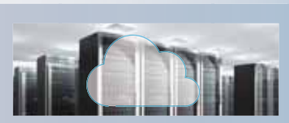
Smart bus stop cloud system — MMsmart BusStop

Factory security solution for monitoring and status management — MMsmartSecurity

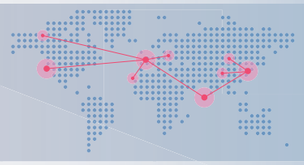
IoT Platform

IoT Platform — MMCloud

Cloud environment



Network line service



Communication device

MMLink-IR611/615

MMLink-LTM

MMLink-Lite LTE

MMLink-GWL

Data collection device

Controller

*1

Programmable display

*2

Data Logger

*3

Monitoring/control target device

Industrial equipments

Construction machinery

Vehicles

Tablets

... etc.

*1 YASKAWA Electric Corporation's "MP series".
*2 Schneider Electric Japan Holdings Ltd.'s programmable display "GP4000 series".
*3 M-System Co., Ltd.'s "Data Mar".

Social infrastructure / Logistics / Factory / AI / IoT Support / IoT Platform / Communication / Device

Product and Service

IoT Platform MMCloud

MMCloud is the IoT platform to manage a wide range of related information, based on device operations.
You can do instant installation and a small-scale startup with extensive standard IoT functions.

Accumulating

Various information around the devices such as operation log, maintenance materials can be stored here.

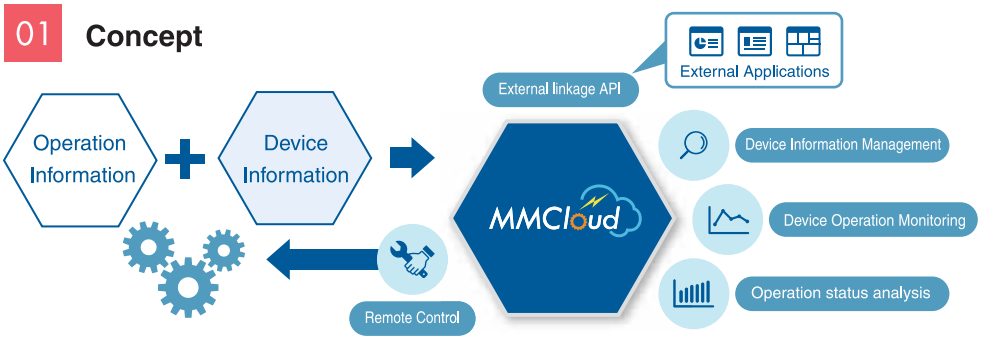
Visualizing

The non-program IoT platform offers you various visualizing functions in the standard package.

Utilizing

Cooperation with other systems leads to higher achievement leveraging the accumulated data.

01 Concept



02 Various IoT applications

Analysis
- Operation status analysis
- Alarm status analysis

Maintenance
- Maintenance and inspection management
- VPN remote connection (optional)

Operation
- Device operation monitoring
- In-layout monitoring
- Trend data monitoring
- Device operation history
- Location confirmation
- Operation time monitoring
- Device information management
- Firmware update
- Alarm notification
- Data download
- Remote control
- Communication log display

03 A reliable and easy-to-manage functionality

- Global usage support
- User authentication
- Permission setting
- File management
- External linkage API
- Mass registration
- Inquiry of packet traffic volume
- Resource management
- Screen customization
- Notification
- Data retention setting

04 Data can be used more productive with the AI solution!

Integrating MMCloud with the AI solution enables to use your data more productive and efficient.

Device operation monitoring

In-layout monitoring

Analysis for operation and malfunction status

Trend data monitoring

IoT / M2M communication devices

MMLink series

MMlink collects data from various devices and sends out to the cloud by a secure closed network or Internet.

MMLink-IR611/615

LTE router with Wi-Fi supporting multi carriers

- High affinity with various system components with Wi-Fi
- VPN function and management function equipped

* The image is MMLink-IR615(4 LAN port)

MMLink-LTM

LPWA analog converter

- Directly send sensor output and contact status to the cloud
- LPWA(LTE Cat.M1), the cheaper line available
- Long life built-in butteries (more than 2 years*)
- Dust and drip-proof

* It depends on the transmission cycle.

MMLink-GWL

LTE gateway supporting multi network carriers

- Embeddable compact size
- Dual SIM installed for the secure redundancy
- High affinity with industrial equipment complied with Modbus/MEMOBUS/MC protocol

MMLink-Lite LTE

Industrial LTE communication adapter (modem/protocol converter/USB router)

- Compact size and lightweight
- Bulletin emergency notification function such as earthquake
- TCP / UDP communication between devices that do not possess the PPP protocol and higher-level systems

* Modbus is a registered trademark of Schneider Automation Inc. MEMOBUS is a registered trademark of YASKAWA Electric Corporation.

■ Product Lineup

Product name	Type	Line	I/F							Features
			LAN	USB2.0	RS-232	RS-485	Digital Input	Analog Input	Wi-Fi	
MMLink-IR611/615	router	LTE	○ *1		○	○			○	Wi-Fi(AP/STA mode) VPN connection Serial Converter
MMLink-LTM	AD converter 	LTE-M					○	○		2 analog and 3 digital input Built-in battery/power supply Dust and drip-proof
MMLink-GWL *2	gateway 	LTE/3G	○		○	○				High performance LTE router VPN connection Programmable gateway
MMLink-Lite LTE	USB modem 	LTE		○						LTE modem Protocol converter GPS

*1 MMLink-IR611:1 LAN port, MMLink-IR615:4 LAN ports
*2 MMLink-GWL can handle client's own protocol by user application development.

Image monitoring service

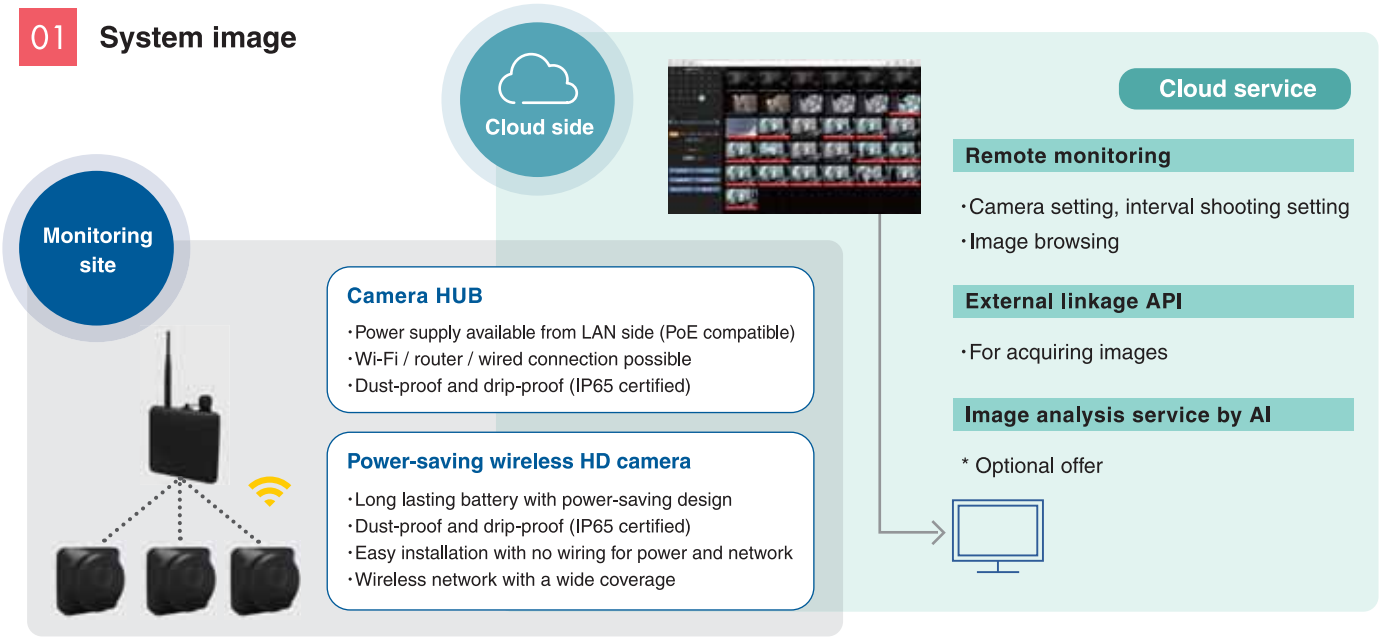
MMsmartMonitor

MMsmartMonitor is the service with wireless cameras and the cloud viewer. The camera is no wiring, cell battery operation, and dust and drip-proof, which simply enables to visually monitoring both indoors and outdoors.

Construction sites | Logistic warehouse | Delivering | Mountains / Rivers | Parking etc.

It can be installed under tough conditions where you have been giving up due to the construction difficulties.

01 System image



02 Multi-angle shooting

03 Use cases

River — Flood monitoring

Landslide site — Secondary disaster monitoring

Construction site — Progress management

Logistics facility — Vacancy status management

Applicable in various situations such as

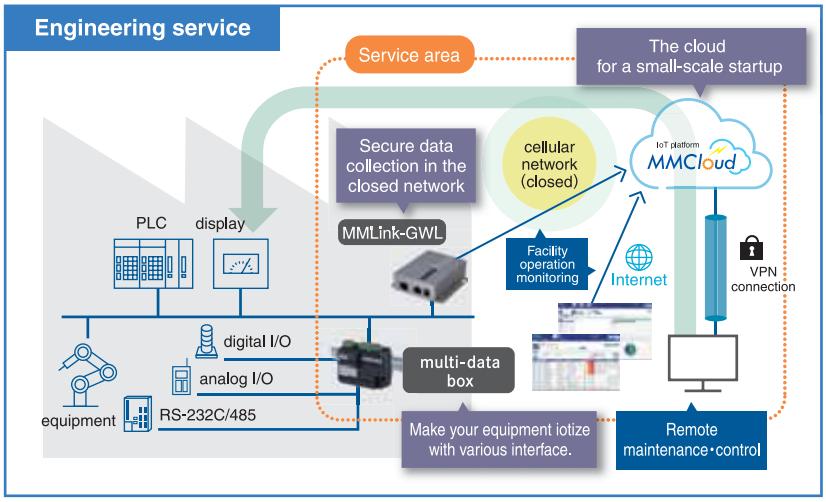
Remote monitoring | Inventory monitoring | Factory progress management | Visual check | A virtual security officer etc.

IoT support

For IoT system verification and a small-scale startup

IoT starter kit

It is the basic package for introducing a small scale IoT system into your business. This set includes the IoT/M2M comminicaton device “MMlink-GWL”, IoT platform “MMcloud”, and data collection gateway.



* “Multi-Data-Box” is the product of Schneider Electric Japan Holding Ltd.

3 key reasons why it is worth trying

・Safe connection by using the closed cellular network. It won’t affect your existing network connections.

・Using our IoT platform “MMCloud” enables you quick start of the IoT systems on a small scale.

・We provide engineering service to set up our IoT service according to the requirements of your environment. This is a simple procedure to start IoT systems.

IT customer service center

Smart Service AQUA

We provide detailed technical support for operating and applicating IoT systems to maximize your business.

01 Menu

Customer support
Technical support service for the introduction and operating systems to maximize the effects

Premium service
Support from the secure environment in the high level

System establishment support
We support the creation of the system for effective use and establishment.

02 Features

- Highly secure facility
- Transparent system operation
- Efficient service on the latest IoT technology

03 Smart Service AQUA supports your business !

- We evaluate user impact in advance and propose the optimal operation method.
- We prepare and provide useful materials (user guide, tutorials and FAQ etc.).
- We create the best educational curriculum to support the establishment of the IoT systems.
- We analyze system operation status and provide advice for effective service usage.

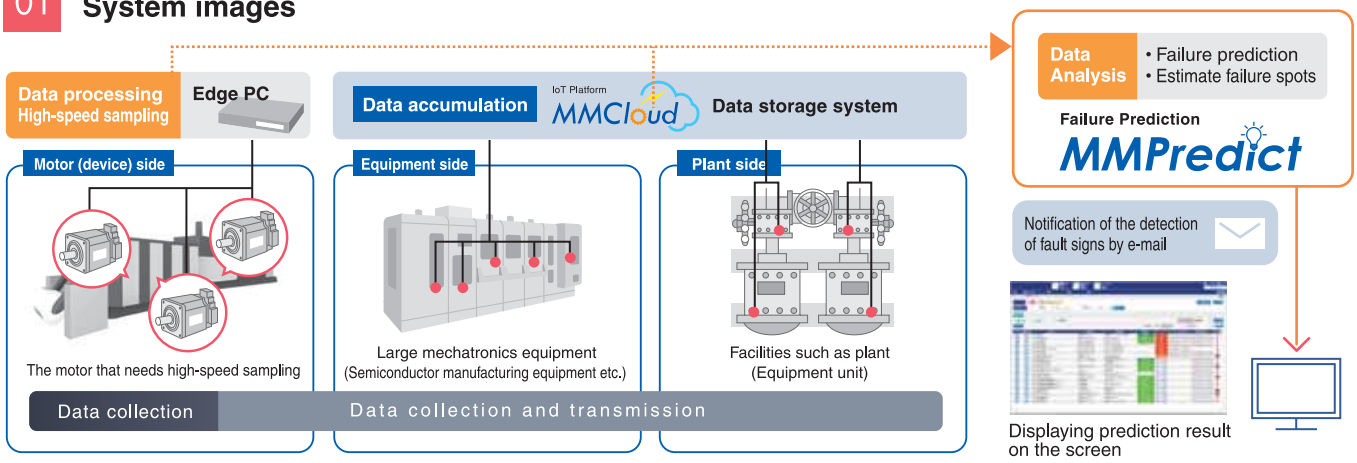
Failure prediction

MMPredict

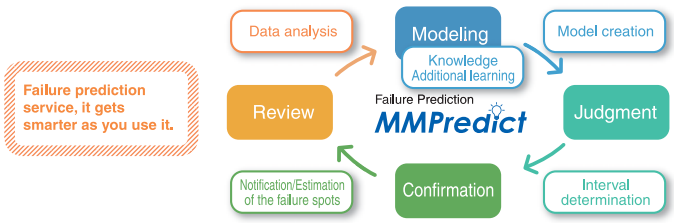
MMPredict detects the signs of defective products via AI analysis and predicts equipment failure.
It enables to reduce the maintenance cost by eficient maintenance according to the manufacturing schedule.

- Fault sign notification by e-mail.
- Support for estimation of failure spots.
- Additional learning of human knowledge.

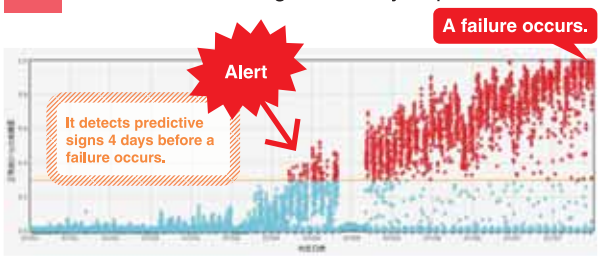
01 System images



02 Features①



03 Features② High accuracy of prediction



* Actual value in our proof experiment

Modelling of the normal condition	Use the correlation between multiple data and create a normal model by AI(deep learning).
Automatic interval determination	Failure is predictied from the degree of deviation between the normal model and the latest operation data. The prediction notification to a person in charge via e-mail.
Estimation of the failure spots	When a sign is detected, the contribution degree information on the sensor concerning is displayed. This function helps to find the spots where the failure had occurred.
Knowledge additional learning function (patent pending)	Learn engineer's knowledge additionally to the prediction result. It is possible to improve accuracy of failure sign detection while using.

04 Features③ You can choose from 3 models. Dedicated algorithms possible to precise prediction

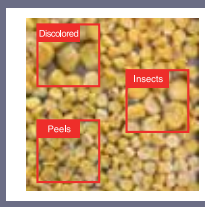
	Motor model	Product model	Plant model
Monitoring object (asset)	Motors of the facility and equipment	Devices	Plants and other equipment group
Number of assets registered	10/50/500 or more (Depend on the contracted plan)		1 facility
Number of models registered	10/50/500 or more (Depend on the contracted plan)		~ 50 pieces
Number of sensors for an asset	2 pieces * Installation of CT sensor is necessary	~ 100 pieces	~ 1000 pieces
Sampling interval	100μ seconds	1 minute~	1 minute~

AI image inspection

MMEye

AI rules to recognize images that cannot be defined by numerical values and enables real-time image inspection.
No need for AI or image processing expertise. It enables improving the inspection efficiency and leveling the quality.

Foreign-object inspection

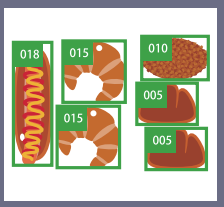


Find extraneous materials in foods.

Topping check

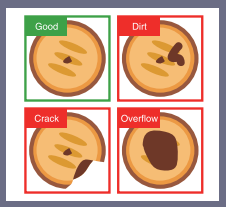
Check whether topping to food products is proper or not.

Counting



Auto-count the number of objects.

Food product inspection

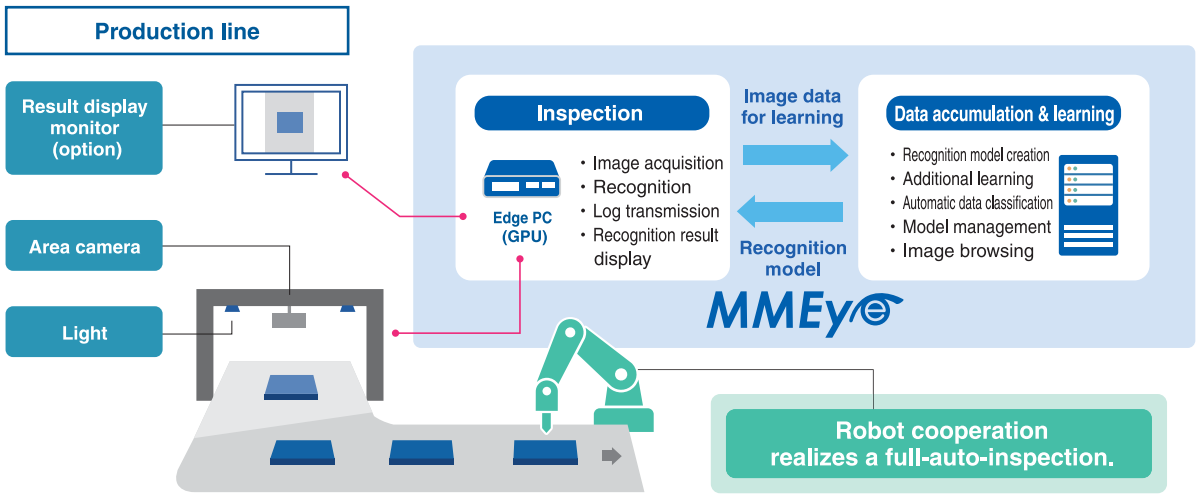


Automatically recognize which category an object belongs to.

Features

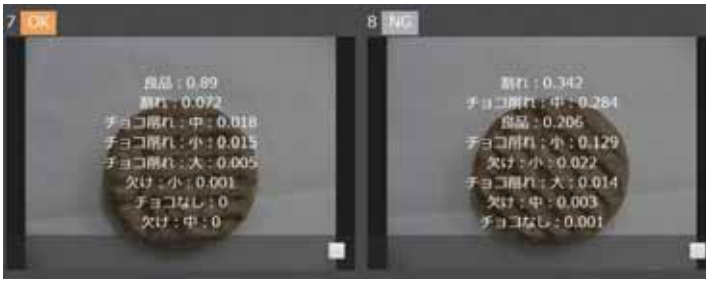
- Using **AI image analysis technology (deep learning)**, you can make highly accurate automatic recognition even for complicated patterns.
- **High-speed image recognition processing can be realized** by using edge PC with GPU.
- Equipped with **additional learning of human knowledge.** Detection accuracy is improved by repeating learning.

01 System images



▼ Create recognition rule on the cloud

▼ Cloud viewer of verification results



Factory security solution for monitoring and status management

MMsmartSecurity

The factory security solution provides real-time monitoring that enables early detection of virus/malware infection to prevent the expansion of manufacturing damages and minimize risks.

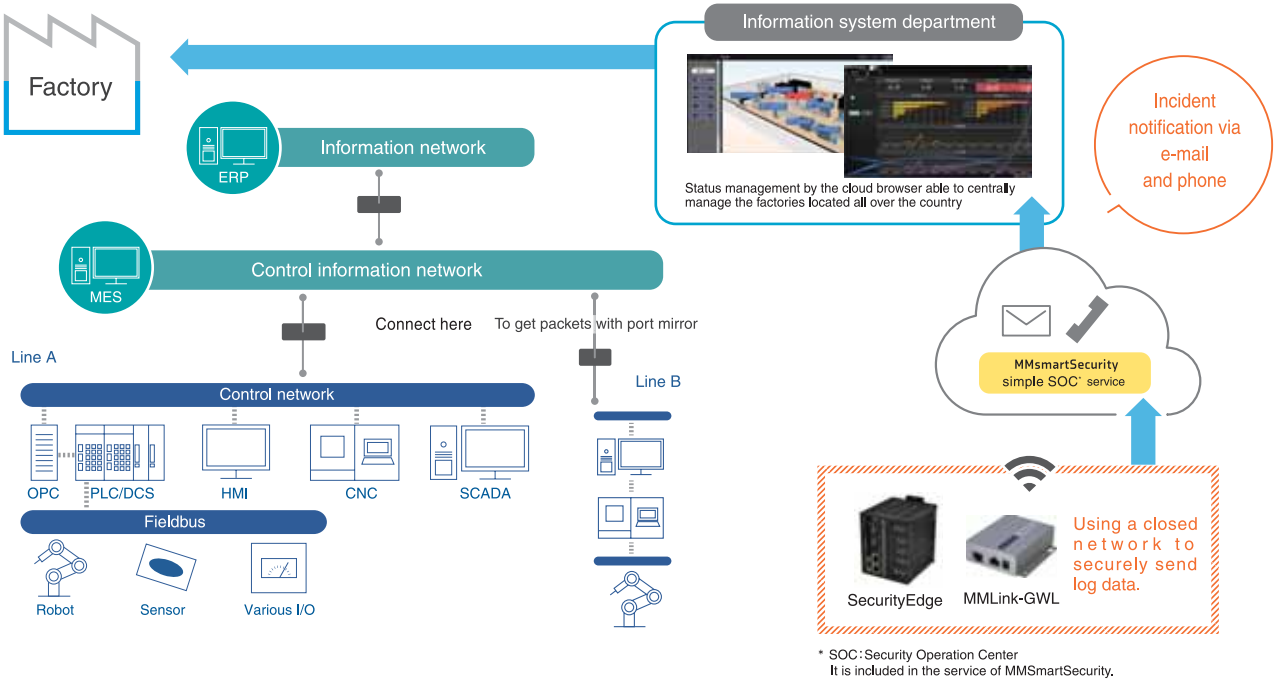
Monitoring and early detection
Detect malware infection early to reduce the risk of damage expansion

Centralized management
No need to place dedicated security officer in each factory

Safe and simple installation
Easy installation only connects to the existing network using the closed network

01 Service image

Information will be shared with relevant departments timely. A prompt response can prevent damage expansion.



* SOC: Security Operation Center
It is included in the service of MMSmartSecurity.

02 Correspondence when an incident occurs

The communication log is monitored. If an abnormality is detected, a push notification will be sent to the manager. It shows the attacking stage, infection spreading status, and infected terminals. It can manage the situation before developing into a serious incident.

1 Abnormality alarm
MMsmartSecurity notifies the occurrence of an abnormality. The manager can check the severity level indicated in the notification e-mail.

Client — Quick response

2 Status check
Confirm the infection status and internal diffusion status from MMsmartSecurity management viewer.
Identify the infected terminals.

Client — Consideration

3 Primary response
The information system department instrusts a person at factory to implement the order to minimize the damage, for example, disconnecting the line.

MMsmartSecurity | Client

For logistic industries

Berth monitoring system at the logistic facilities

Smart Berth System™

Learn the truck parking status by AI analysis of the camera images and display it on the management viewer.
Collaboration with the berth reservation system will reduce the amount of logistic warehouse's management work.

Truck in/out management
Notify when the reserved truck is arrived.
Efficiency can be improved by prior preparation.

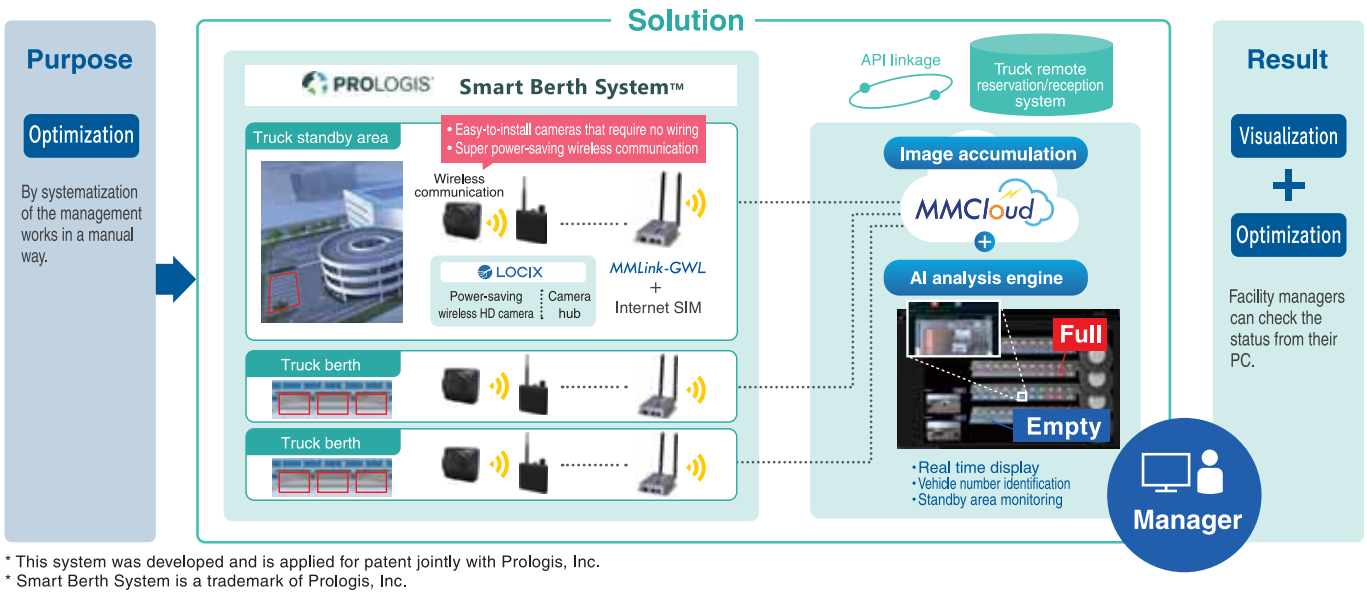
Truck identification
Determine and display the parking spot's status as full or empty.

Equipment damage monitoring

Work time analysis
It is able to tell the driver right away whether the truck can be parked.



01 Case Study：Prologis Park Ichikawa 3



* This system was developed and is applied for patent jointly with Prologis, Inc.
* Smart Berth System is a trademark of Prologis, Inc.

02 Features

Quick launch	• The camera does not need any wiring for power and network. • Power-saving design makes battery replacement unnecessary for several years. • You can start monitoring quickly, just by camera setting on the screen
Affordable price	This service package does not require system development, it can be introduced with affordable prices.
AI-based analytic service	Parking status management (truck in/out) by AI.
Customizable design	The status indications can be placed on the image supplied from the client, for example, the actual floor layout map.
Applicable to a multi-tenant type of the warehouse	It is able to provide a monitoring screen for each tenant owner. It supports the work efficiency of tenant owners.
Improve the additional value for your business	It can be used together with other company's systems. It can utilize the information data from our system to the existing system (vehicle number, time of truck in/out).

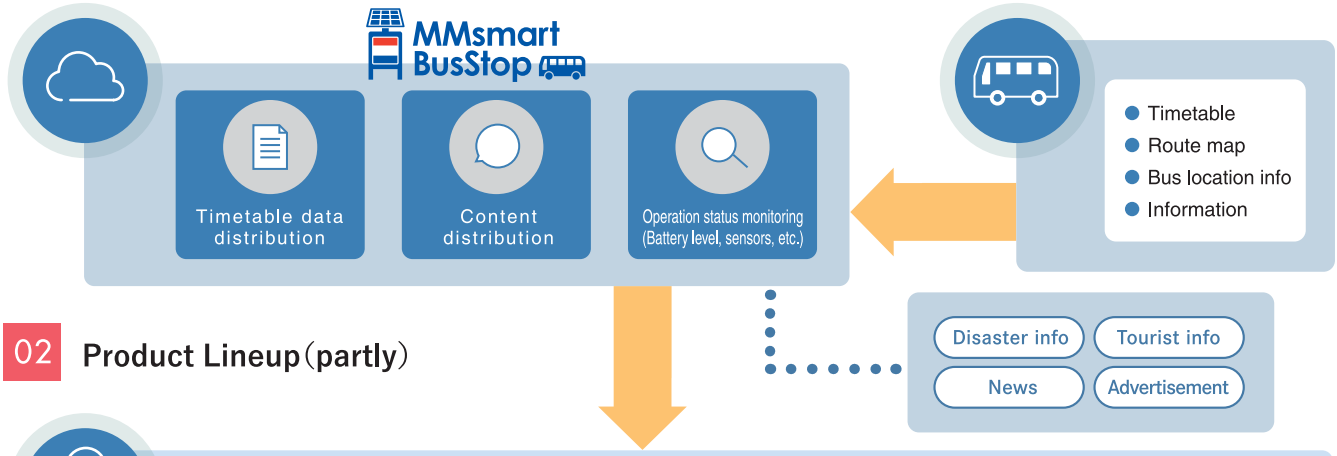
Smart bus stop cloud system

MMsmart BusStop

Smartize bus stops that have been difficult to be digitized due to the unavailability of power supply environment using a power-saving technology.

- Optimize bus stop management by the timetable creation and distribution function.
- Indicate urgent breaking news in emergency.
- Support inbound tourists by the multilingual display.
- Provide new revenue to bus companies by posting advertisement.

01 Cloud service image



02 Product Lineup (partly)

Nishitetsu Group

Smart bus stop

Considering the balance between income and investment, we prepare various models that are suitable for the installation environment.

	Downtown	City	Suburbs	Depopulated area
Power supply	AC100V	AC100V	- (solar panel)	- (butteries)
Display	Transmissive LCD (with a back light)		Reflective LCD (with a back light)	Electric paper (B&W, no-light)
Bus location info	○	○	- (power saving)	- (power saving)
Advertisement	Movies	Movies	Still images	-

* The lineup and the specifications above may be changed without any previous notice.
* The suburb model and the depopulated area model is in development as of January, 2020.
* This system was developed and patented jointly with Nishitetsu M-Tech Co., Ltd.

03 Bus companies introducing Smart Bus Stop (As of January, 2020) *Listed in order of introduction

- Nishitetsu Bus Kitakyushu Co., Ltd.
- HOKURIKU RAILROAD Co., Ltd.
- Iwatekenkotsu Co., Ltd.
- Kokusai Kogyo Co., Ltd.

Many bus companies in Japan are going to introduce Smart Bus Stop.

IoT / AI solutions introduction cases

Aratani Civil Engineering Consultants CO., LTD.

[Type of industry] Consulting for civil engineering construction, etc.

Provided solution

Communication module	Application
MMLink-GWL	MMsmartMonitor
AI service	Other
—	—

Disaster monitoring for sites of debris flow in Hiroshima Prefecture

Placing sensors with monitoring cameras makes it possible to check the current status right away in case the sensors detects something.

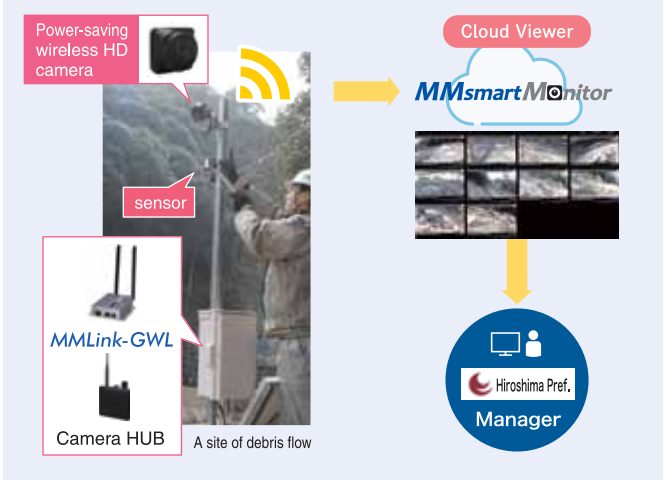
Client's issue

Aratani Civil Engineering Consultants is considering the secondary disaster monitoring system with sensors and cameras for the sites of debris flow in Hiroshima prefecture. However, such system needs over 100kg equipment (a camera, a control system, a solar power system, etc.) and has some problems for reliable operation (system stops by charge shortage, lost of vision, etc.)

Beneficial result

- → Easy installation with no wiring for power and network.
- → Compact and light equipment with power saving system (battery driving camera and cloud service)
- → Multi-angle shooting, 5 cameras for 1 camera hub.

Solution



Japan Agricultural Cooperatives in Saito

[Type of industry] Agricultural Cooperatives in Saito city located in the center of Miyazaki Prefecture.

Provided solution

Communication module	Application
MMLink-LTM	MMCloud
AI service	Other
—	—

Fuel tank monitoring system for plastic greenhouse

Using various standard functions of MMCloud reduces the cost and shortens the lead time of IoT introduction.

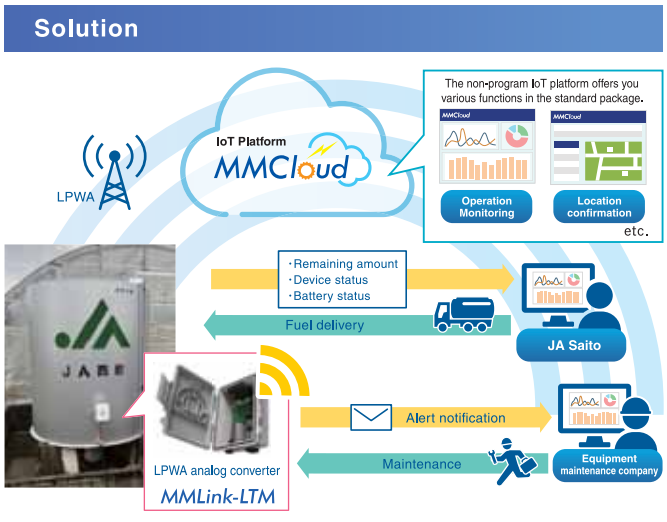
Client's issue

Plastic greenhouses needs strict temperature management for growing crops because the crops may be damaged in case the fuel is shorted. So farmers have to check the amount of fuel in their tanks every day and ask JA to deliver the fuel. Therefore, JA cannot determine delivery routes in advance, which is quite inefficient.

Beneficial result

- → Visualization of the remaining amount of fuel and alert notification, makes farmers free from daily fuel check.
- → By visualization and location confirmation functions, JA can plan delivery routes beforehand and improve their efficiency.
- → The precise demand prediction makes the fuel procurement proper in the price and the amount.

Solution



* This case was introduced in cooperation with YSC inc.

IKARI SHODOKU CO., LTD.

[Type of industry] Hygiene service such as an insecticide, rat-proof, bacteria-proof, energy-saving.

Provided solution		
Communication module	—	Application	—
AI service	MMEye	Other	—

Automatic classification of insects captured in a insects trap

Early recognition of insect occurrence prevents from the swarming.

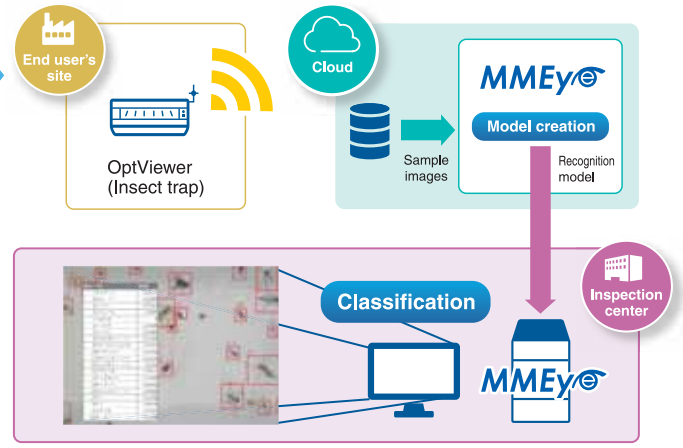
Client's issue

IKARI SHODOKU offers reports of insects captured in customers' site as a service. They collect and visually check the insect capturing sheets of insect traps, and classify what kinds of insects occur. The work is done by the staffs and it takes about 2 weeks until submitting a report to the customer. IKARI SHODOKU aims to shorten the time for reporting.

Beneficial result

- → Modeling about 20 kinds of insects to auto-recognize and auto-count the number for each insect captured in the sheet, which shortens the time for reporting.
- → By attaching identification rate to the results, the reliability of the results is guaranteed.

Solution



* OptViewer is a trademark of IKARI SHODOKU CO., LTD.

MAYEKAWA MFG. CO., LTD.

[Type of industry] Manufacturer and seller of industrial freezers and various gas compressors.

Provided solution		
Communication module	MMLink-3G	Application	MMCloud
AI service	MMPredict	Other	—

Failure prediction of industrial freezers by AI

AI (deep learning) realizes failure prediction in a short time.

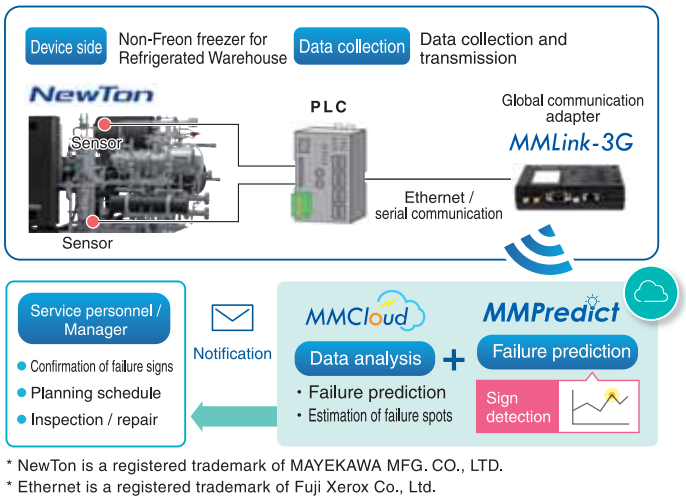
Client's issue

MAYEKAWA MFG 's main products are industrial freezer. If the machine is in failure, it might damage to products stored in customers facilities and may cause huge losses. They replace the consumables at an earlier stage in order to prevent machine failure, but the cost was a burden.

Beneficial result

- → They could reduce the maintenance cost by replacing parts only required.
- → By predicting the early signs of machine failure, it is possible to maintain the machines based on the
- → It can estimate the failure spots to take effective measures.

Solution



* NewTon is a registered trademark of MAYEKAWA MFG. CO., LTD.
* Ethernet is a registered trademark of Fuji Xerox Co., Ltd.

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