

VALUE CREATION



OUR INSIGHT AND STRATEGY

Becoming an Innovation Partner for the IoT Era is a key part of Hitachi's 2018 Mid-term Management Plan. The Lumada IoT platform will help Hitachi pursue new value through collaborative creation with customers.

New Value Through Collaborative Creation with Customers

Across the world, from North America to Europe and China, the creation of innovation through digital technology is accelerating. In Japan, too, as part of its "Society 5.0" program,^{*1} the government has taken the lead in driving a revolution in services and business and transformation of industry structure through digitalization. Amid these rapid changes, in May 2016 Hitachi launched the Lumada^{*2} IoT platform. Based on the two key ideas of collaborative creation and connections, Lumada is designed to create value through the company's Social Innovation Business by connecting customer value chains and resolving business issues.

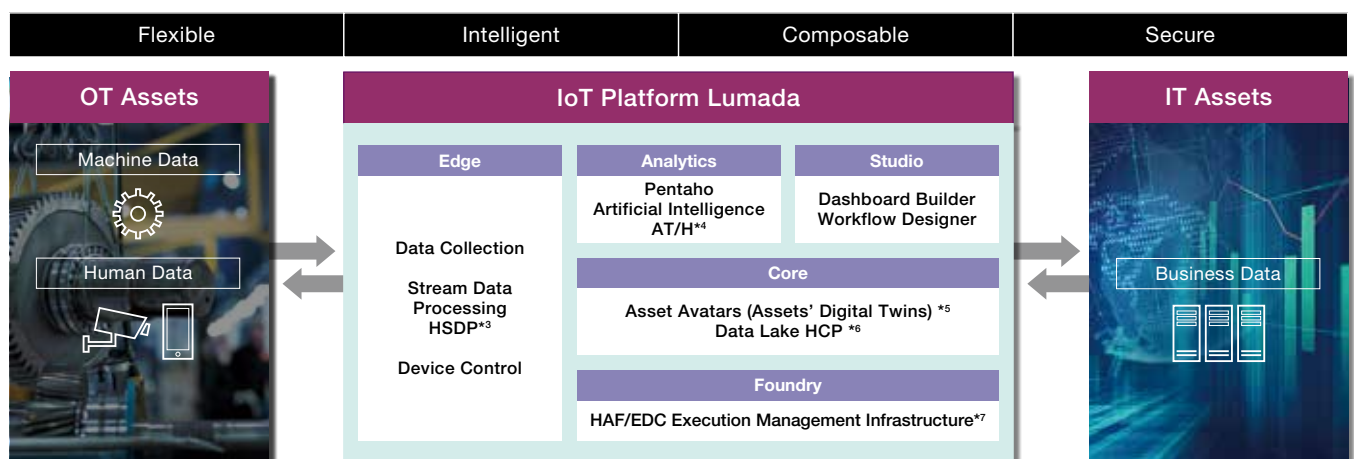
Lumada is a distillation of Hitachi's rich and extensive experience in OT (operational technology) and IT solutions, and as such is Flexible, Intelligent, Composable, and Secure. Recognizing that customers usually prefer to make the best possible use of systems that are already deployed and operational, we have prioritized composability as a particular strength: the ability to flexibly combine Lumada

with existing systems. Lumada is also easy to link with other IoT platforms and systems, allowing it to support a broad range of industries and customer cases. That Lumada is made up of proven, commercialized, and highly trustworthy technology is another advantage. This technology includes Pentaho, an integrated analysis software package that can bring together diverse data stored in a variety of formats and apply analysis from multiple perspectives, and Hitachi AI Technology/H, a multipurpose AI.

^{*1} Society 5.0: An umbrella term for several related initiatives designed to create a "Super Smart Society" that will respond to social needs efficiently and meticulously by merging cyberspace and the physical realm at a high level. The term implies a revolution driven by innovations in science and technology creating a successor to the hunter-gatherer, pastoral-agrarian, industrial, and information-based models of society.

^{*2} Lumada: A name created by combining the words "illuminate" and "data," reflecting the fact that Lumada sheds light on large quantities of data to reveal hidden connections and provide customers with valuable business insights.

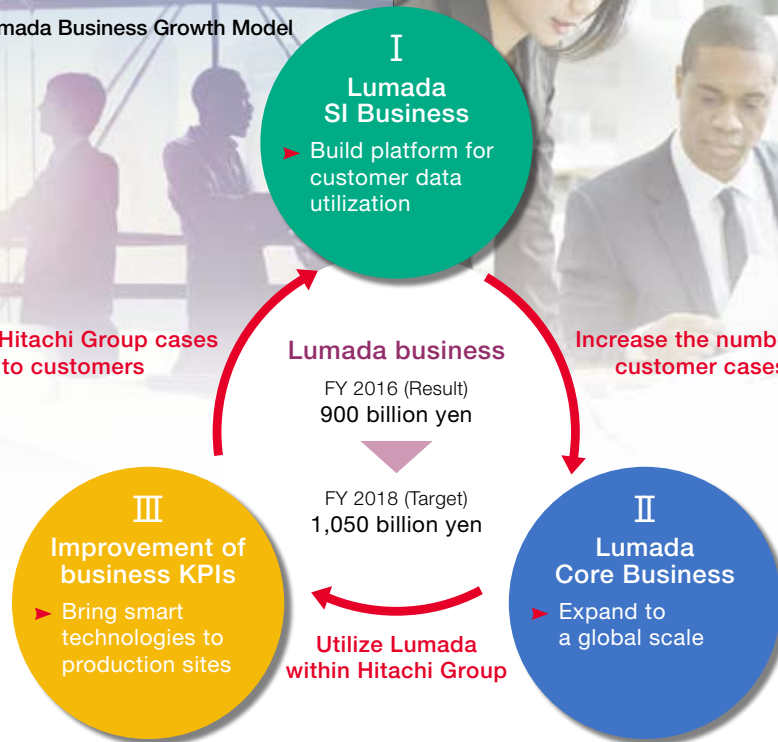
The Lumada IoT Platform



^{*3} HSDP: Hitachi Streaming Data Platform. ^{*4} AT/H: Hitachi AI Technology/H. ^{*5} Digital Twin: The concept of using digital information about a product to build its duplicate (twin) in a visual space. The concept has been proposed by NASA for its next-generation aircraft development. ^{*6} HCP: Hitachi Content Platform. ^{*7} HAF/EDC: Hitachi Application Framework/Event-Driven Computing.



Lumada Business Growth Model



Lumada Business Growth Model

Hitachi designed Lumada to be the ultimate tool for pursuing new value in collaborative creation with customers, and intends to grow the Lumada business through a combination of three monetization models.

First, Hitachi will provide individual systems to customers through the Lumada SI (Systems Integration) Business. As this business gains experience and knowledge, it will develop new customer cases that can be used to grow the Lumada Core Business, creating “solution cores,” blueprints allowing Hitachi to provide leading-edge digital solutions—the second monetization model. Adoption of these ideas internally will also drive improvement in management indicators across the entire Hitachi Group, allowing monetization in a third way.

In the Lumada SI Business, Hitachi develops and delivers data infrastructure customized to meet individual customer requirements. The Lumada Core Business, meanwhile, is a service business in which Hitachi improves management indicators and resolves customer issues by utilizing artificial intelligence to convert customer data into value. Because the Lumada Core Business allows the nimble, global deployment of solution cores created in the Lumada SI business, customer cases can be optimized for more general application in a variety of industries. The Lumada Core Business is expected to expand rapidly. Meanwhile, applying Lumada within the Hitachi Group and its entire value chain will make production sites smarter, reducing manufacturing costs and optimizing inventory management.

Hitachi expects the combination of these three models to help the Lumada business as a whole exceed 1 trillion yen in revenue for fiscal 2018.

Lumada Promotion Framework

The Hitachi Insight Group, an elite team including OT and IT specialists from Hitachi, Ltd., Hitachi Data Systems Corporation, and other Hitachi Group IT businesses, is playing a central role in promoting the Lumada business. Since beginning operations in May 2016 at its headquarters in Santa Clara, California, the Hitachi Insight Group has welcomed hundreds of world-class new hires. Particular emphasis was placed on hiring people with experience in key positions at leading Silicon Valley enterprises.

In April 2017, the research team Insights Laboratory was established. Gathering together researchers, designers, data scientists, and solutions architects from a wide variety of fields, Hitachi is accelerating the pace of innovative collaborative creation by working with customers to develop new ideas, design systems, and demonstrate concepts and value.

Additionally, to promote front-led collaborative creation with customers, in February 2017, Hitachi named a Chief Lumada Officer (CLO), a newly created position, for each business unit. CLOs are responsible for promoting the use of Lumada in such reforms as increasing the efficiency of work processes. The CLOs also share information distilled from the on-site experience of the leading Lumada businesses. Their role is to develop new business models within the Hitachi Group. CLOs will deepen links to the Hitachi Insight Group and promote the expansion of the solutions business and the creation of customer cases within the Hitachi Group.



```

... object to mirror all
mirror_mod.mirror_object = mirror_ob

if operation == "MIRROR_X":
    mirror_mod.use_x = True
    mirror_mod.use_y = False
    mirror_mod.use_z = False
elif operation == "MIRROR_Y":
    mirror_mod.use_x = False
    mirror_mod.use_y = True
    mirror_mod.use_z = False
elif operation == "MIRROR_Z":
    mirror_mod.use_x = False
    mirror_mod.use_y = False
    mirror_mod.use_z = True

Application at the end - add back the de_selected = 0 the modifier object
mirror_ob.select = 1
modifier_ob.select = 1
bpy.context.scene.objects.active = modifier_ob
print("Selected" + str(modifier_ob)) # modifier_ob is the active ob
mirror_ob.select = 0
time = bpy.context.selected_objects[0]
bpy.data.objects[time.name].select = 1
except:
    print("please select exactly two objects, the last one gets the modifier unless its not a mesh")

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Lumada Development Case Studies

As of March 2017, Hitachi has collected and published 203 Lumada customer cases, mainly involving the industrial sector, representing successful collaborative creation with customers. We divide the types of value customers typically seek to create into four categories—boosting sales, cost optimization, risk mitigation, and cost visualization—and roughly half of the customer cases published as of fiscal 2016 were for cost visualization (92 of the 203 total cases). Cost visualization is a crucial gateway to the use of Lumada: by letting customers directly experience the value of the platform, it encourages its application in other areas, allowing even greater results to be achieved.

One client of Hitachi Consulting Corporation, a leading beverage maker, had seen its costs mount considerably due to residual odors on some of its products, depending on the quality of water used. The Lumada platform was employed to collect and manage all of the client’s water-related information, from intake to drainage, and to clarify water quality maintenance and its costs, enabling Hitachi to offer a proposal on a new filtration system and approaches to managing its facilities.

Hitachi used the solutions gained from this customer case in proposals made not only to beverage makers but also to other businesses for which water quality management was an issue. We were able to sign contracts with customers in a variety of industries as a result, including water, food, and papermaking.

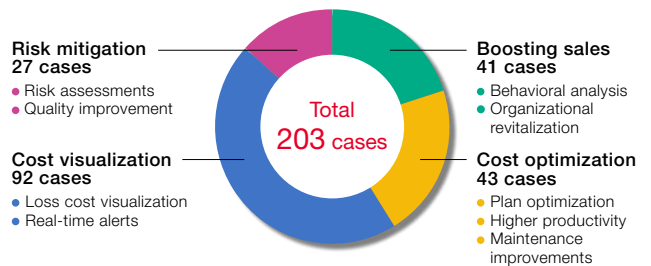
Through Front-led collaborative creation with customers, this project contributed to resolving issues that they faced; it also drove the development of new solutions. Hitachi will continue to expand the Lumada Core Business by leading collaborative creation with customers from the Front and capturing new customer cases.

Proactively advancing the use of Lumada within the Hitachi Group has also allowed us to improve our management indicators and therefore our enterprise value. Lumada has proven useful in the realm of cost structure reform, which has long been a focus for Hitachi. Establishing

a Lumada workplace dedicated to the Hitachi Group and making full use of analytics and artificial intelligence allows work processes to be visualized and optimized and makes supply chains more efficient from end to end.

As of the end of March 2017, there are 23 Group companies participating in this program, including Hitachi, Ltd., Hitachi Chemical Company, Ltd., and Hitachi Metals, Ltd., demonstrating the value of using actual data from production sites.

Customer Cases (As of the end of March 2017)



Typical Customer Cases

| | | |
|---|---|---|
| Boosting sales | Optimize promotions based on customer attributes and behavioral history | Number of customers increased by more than 10% |
| Adopted by companies including a professional baseball team | | |
| | Analyze employee work activities and reflect in improvement measures | Order rate improved by 27% |
| Adopted by call centers and financial institutions | | |
| Cost optimization | Predictive failure diagnostic service for large-scale air compressors | Operational efficiency improved by 20% |
| Monitoring of 250 domestic and 20 overseas facilities | | |
| | Predictive failure diagnostic service for medical equipment (superconductive MRI) | Downtime reduced by 16% |
| Introduced by about 90% of customers purchasing superconductive MRI | | |
| Risk mitigation | Analyze the operating condition of manufacturing equipment to detect signs of product defects | Spoilage expenses reduced by 75% |
| Adopted by electrical equipment manufacturers | | |

Giving Birth to New Value with Our Customers

Keiji Kojima

Senior Vice President and Executive Officer
CEO of Services & Platforms Business Unit
Hitachi, Ltd.



Collaborative Creation with Customers Drives True Competitiveness Overseas

Since unveiling Lumada in May 2016 at the largest IoT event in North America, Informa's Internet of Things World, we have received a great deal of valuable feedback on Hitachi's strategy in discussions with customers around the world.

My impression is that customers outside Japan in particular admire our concept of collaborative creation with customers, calling it "highly unique." Because Lumada is based on Hitachi's long experience in the SI industry, constant and careful attention to customer needs is fundamental to the business. Our goal is not simply to spread an IoT platform—we want to use Lumada alongside customers to resolve their issues. In my view, our customers' understanding that this is our starting position is the reason so many of them have high expectations for Lumada.

In the IoT society, what customers seek is not products but the resolution of business issues. Hitachi is aiming to pivot to a results-based business model, and Lumada is central to that.

Hitachi's Position in the Rapidly Growing IoT Market

Hitachi's extensive product catalog and long experience with IT solutions puts it in an advantageous position within the IoT market. We are intimately familiar with a wide range of products and equipment, from production facilities and railroads to construction machinery. Our Group is also rich in knowledge and experience regarding the evolutionary stages of OT, such as operational controls for trains. IT-only vendors do not have these strengths.

As long as there are products and equipment in the world, enterprises will grapple with issues like how to manage their assets more efficiently and how to reduce the costs of management. This means that Lumada will be able to contribute to a rapidly expanding range of markets. It is not restricted to the bounds of any particular industry. At the same time, carefully selecting markets where bigger results can be achieved more quickly will be crucial to helping the Lumada business grow.

World-Class Human Capital Reforming Organizations and Markets

Santa Clara, California, where the Hitachi Insight Group is based, is now home to many accomplished Silicon Valley veterans—people who play a leading role in the world of IT. In the US, this sort of talent is known as "rock star" human capital.

Most of these "rock stars," it seems to me, share our feeling that the IoT solutions offered by pure IT vendors are limited by a lack of knowledge of products and equipment. The Hitachi Insight Group is where they can fully exercise their creativity to make new breakthroughs.

And their dynamism is astounding. As soon as they join the company, they crisscross the world, visiting production sites in Japan or holding in-person discussions with key figures for their work. New ideas and proposals come in a constant stream.

What we wanted from these new members of our organization was speed and the kind of culture and environment that makes speed possible. The work environments they create and the way they do their work has a big impact on existing employees. The power they have to change both organizations and markets is palpable.

The Next Challenge: Worldwide Expansion

Going forward, I believe that Lumada's challenge will be to strengthen its service delivery globally. Within Japan, the Group's services division is well developed, and Hitachi's ability to provide complete, end-to-end solutions, including ongoing maintenance, is highly valued by customers. We aim to strengthen our delivery channels to allow us to deliver the same level of service elsewhere in the world. Once this framework is in place for Lumada, we expect the rapid expansion witnessed in Japan to be repeated on a global scale.

OUR ACHIEVEMENTS

Omika Works, Hitachi, Ltd.

The wide-ranging development of Hitachi’s Lumada Core Business, in which accumulated customer cases and internal deployment studies are offered as solutions to customers facing similar issues, is vital for expansion of the Lumada business as a whole. The high-efficiency production model established at Hitachi’s Omika Works is one example of this cycle. Having dramatically reduced production lead times through IoT technology, this model is now attracting significant attention among Lumada’s solution cores.

High-Efficiency Production Through IoT

Omika Works has supplied systems for social infrastructure like power generation, railways, and water supply for half a century. High reliability is a must for social infrastructure, and Omika Works is unique in addressing customer requirements with exacting care at every stage of the process, from development of hardware and software to maintenance and service. Omika Works is a high-mix, low-volume manufacturer, meaning that its products are custom-made for each individual client.

The common wisdom around mass-production factories is that, with standardized product specifications and manufacturing procedures, efficiency can be increased relatively easily through automation. At a plant like Omika Works, however, specifications differ by order, specifications and delivery dates are subject to frequent change, and production tends to rely on a greater proportion of highly skilled workers. For factories like this, improving efficiency through optimization and automation of manufacturing processes is generally held to be difficult.

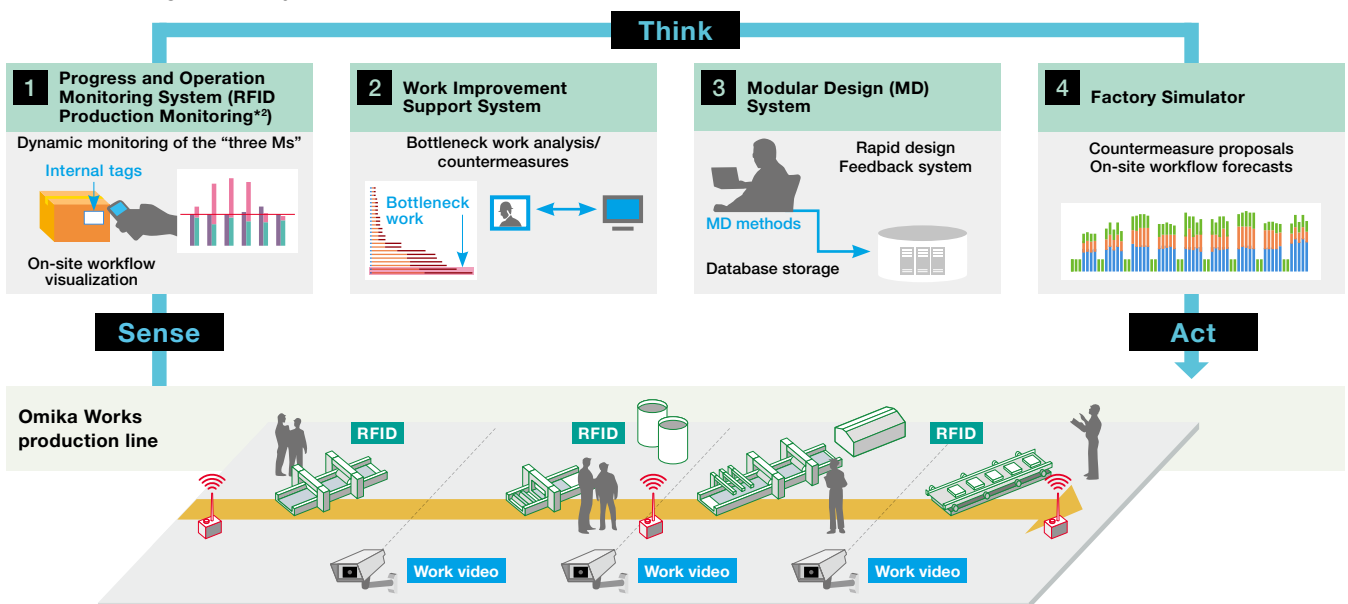
Nevertheless, as part of the Hitachi Smart Transformation Project, which has been reforming Group

cost structures since 2011, Omika Works has embraced the challenge of revolutionizing design and manufacturing by using IoT technology to the best possible effect. To eliminate wasted effort and advance optimization of production planning through visualization of the entire production process, Omika Works not only transitioned to a high-efficiency production model linking four separate systems—the Progress and Operation Monitoring System, the Work Improvement Support System, the Modular Design System, and the Factory Simulator—it also implemented a “Sense, Think, Act” cycle for information about the “three Ms”: man, machine, and material. Together, these measures reduced production lead time for representative products*1 by 50%.

*1 These representative products are control devices for power and social industry sectors, accounting for roughly 20% of total production at Omika Works.

| | |
|---|--|
| Progress and Operation Monitoring System | Performs unified analysis and visualization of production progress and equipment operations to allocate production resources optimally and promote timely improvements when delivery delays are expected |
| Work Improvement Support System | Facilitates work improvement and shortens the work improvement cycle by automatically extracting processes where actual and expected work times differ and displaying work videos and instructions |
| Modular Design System | Standardizes shared portions of existing individual product designs as modules, reducing the number of parts that must be designed individually and shortening design lead time |
| Factory Simulator | Responds to production plan updates such as changes to order quantities or delivery dates by automatically preparing a feasible optimized production plan and adjusting part procurement details |

Omika Works High-Efficiency Production Model



*2 RFID: Radio Frequency Identification. A noncontact, automatic detection technology that reads information via radio waves from media such as tags and cards containing IC chips and small antennas.

Accumulated Operational Technology Generates Results

In order to enjoy the benefits of these IT systems to the utmost, hands-on manufacturing knowledge is vital.

Manufacturing involves a chain of connected systems, from order acceptance through engineering (design), procurement, production, quality assurance, and maintenance. Instead of attempting to improve each system individually, adopting the optimal approach for the entire process is crucial. Omika Works' OT allows it to precisely understand the interdependencies between these systems and know how to appropriately address challenges arising in the "three M" areas. Established using OT accumulated over many years, this new production model can now be developed for inclusion among the solution cores Hitachi provides to the manufacturing industry.

Hitachi's IoT: From Omika to the World

To bring the results achieved using IoT at Omika Works within reach of a broad range of customers pursuing improvements in their business, in July 2017, versions of the Progress and Monitoring Operation System and Work Improvement Support System were made available as Lumada solution cores for the manufacturing field, generalized to ensure applicability to a wider range of production facilities. Many customers have already joined our training program introducing the Omika Works IoT implementation case study, and manufacturing reform through collaborative creation with Hitachi is spreading, particularly among high-mix, low-volume manufacturers.

In May 2017, the machine tool manufacturer Okuma Corporation embarked on a collaborative creation project aiming to build on the results achieved at Omika Works and establish an advanced production model that supports mass customization.*1 An experimental model was set up at Okuma's new Dream Site 2 factory. Machine tools are a classic example of a high-mix, low-volume manufactured product, created by processing and assembling thousands or even tens of thousands of components according to diverse customer specifications. Recognizing this opportunity, Hitachi and Okuma will continue working on new generations of factory technology through integration of their manufacturing know-how and collaborative creation on the themes "visualization of production" and "a faster factory control cycle."**2

In recent years, the manufacturing industry has seen customer needs diversify due to the rapid development of digital technology. Increasingly, manufacturers are calling for production systems that can respond to these diverse needs quickly and increasing productivity by making the best use of the "three M" resources on hand has become a challenge. Through collaborative creation with customers, Hitachi will continue to identify management challenges and provide customers with solutions that enable them to digitize the supply chain and production activity from an end-to-end perspective and to improve management indicators.

*1 Mass customization: Realizing mass-production levels of productivity even in high-mix, low-volume manufacturing.

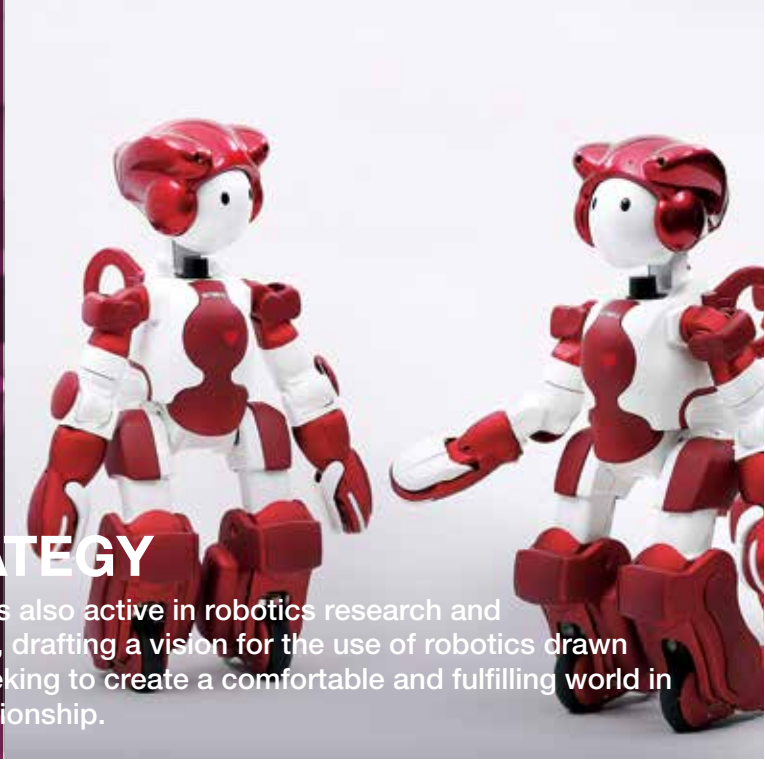
**2 Faster factory control cycle: Deploying a process control system that uses identification tags to grasp the production process more accurately, enabling both reliable identification of bottlenecks and swift remedies.



CASE 02 ▶ Robotics

OUR INSIGHT AND STRATEGY

As an Innovation Partner for the IoT Era, Hitachi is also active in robotics research and development—sharing the future with customers, drafting a vision for the use of robotics drawn from projections of ideal future societies, and seeking to create a comfortable and fulfilling world in which humans and robots enjoy a symbiotic relationship.



Robotics Solutions for the IoT Era

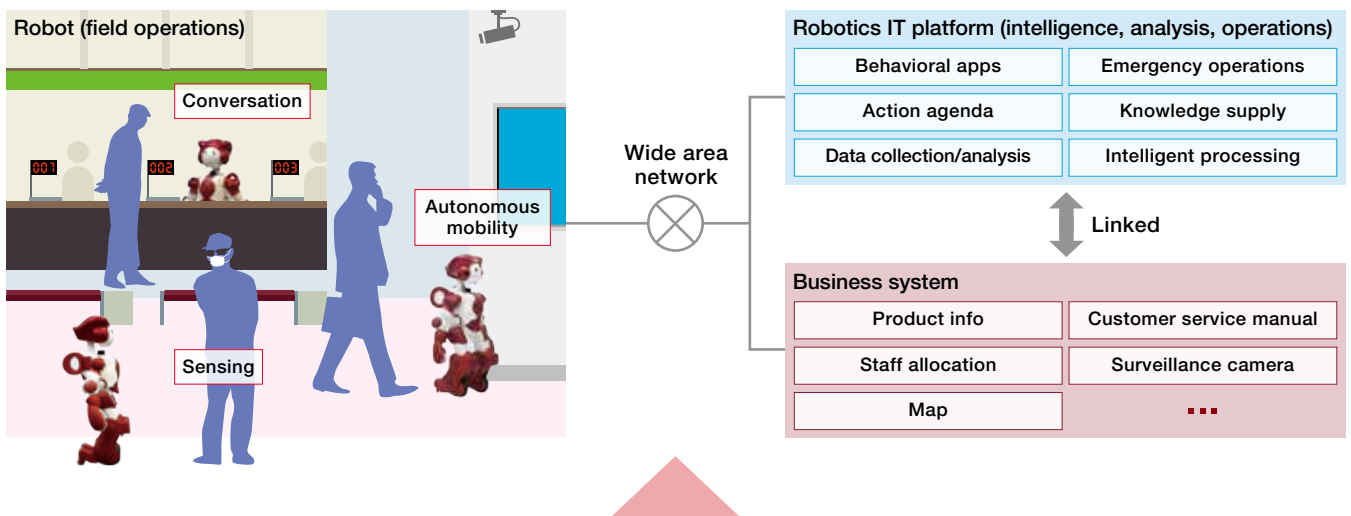
Robots raise quality of life and contribute to efficiency and safety improvements not just in manufacturing but throughout our daily lives by performing tasks that are difficult for humans and compensating for labor shortages. In the future, robots are expected to be able to connect with each other to gather necessary information, learn for themselves, and work in an ever-broadening range of fields.

Since unveiling a computer-controlled, artificially intelligent robot in 1970, Hitachi has integrated the fruits of its ongoing technical research and development in this field into a wide variety of products. In the 1980s, we helped drive adoption of industrial robots, pioneering technical developments as part of a national project. In the 1990s,

our attention turned to the practical applications of robotics, with development focused on how robots could play a role in the community, including the fields of public services, medicine, and welfare. Since the turn of the century, Hitachi has concentrated its efforts on humanoid robots like EMIEW that are specifically designed for symbiotic coexistence with humans.

Going forward, Hitachi will continue to draw on its long-cultivated robotics technology and experience as it puts the Lumada IoT platform to work in a wide variety of fields, collaboratively creating with customers new businesses, societies, and lifestyles in which humans and robots can symbiotically coexist.

Overview of EMIEW3 and Hitachi's robotics IT platform



The left side of the diagram depicts on-site locations, such as public facilities and stores. The right side depicts the computing environment.

The robotics IT platform (top right), responsible for the robot's intelligence processing and operational control, is linked to business systems (bottom right) and controls multiple EMIEW3s installed on-site and connected via the network. Receiving instructions from the robotics IT platform, each EMIEW3 can perform a variety of services, such as interacting with and guiding customers. Information recognized by an EMIEW3 through its various sensors is sent to the robotics IT platform, where it is stored and used to improve the precision of EMIEW3 operations.

OUR ACHIEVEMENTS

Hitachi's latest robotics technology addresses the needs of today's society and aims at a symbiotic coexistence of humans and robots.

EMIEW3: The Humanoid Robot

Hitachi has long promoted the development of robots that coexist symbiotically with humans, aiming to create robot services with rich communicative abilities that can safely and symbiotically coexist with humans.

Unveiled in 2016, EMIEW3 agglomerates Hitachi's decades of knowledge and experience into a robot featuring high levels of both information processing and autonomy. The robotics IT platform, responsible for information processing and control of the robot itself, is located in the cloud. It connects to the robot in real time, enabling it to perform advanced support services like interacting with and guiding customers. EMIEW3 can identify customers in need of support and approach them on its own initiative, share information with other EMIEW3 units, and hand off service tasks to other parties when necessary. EMIEW3 is equipped with a function to regain a standing position by itself in the unlikely event that it should fall over.

Hitachi aims to use EMIEW3 for guidance services in airports, train stations, and other situations that may require

multilingual support and autonomous operation, as well as in banks and commercial facilities that handle multiple complex services in a single branch. Through field trials at airports, train stations, and commercial facilities, we will continue collaborating with customers to create new practical applications for EMIEW3.

"EMIEW" stands for "Excellent Mobility and Interactive Existence as Workmate," directly reflecting Hitachi's goal of a robot that can exist in symbiosis with humans, moving fluidly and communicating through speech.

EMIEW2, announced in 2007, was able to move at the pace of a fast-walking human, and combined a number of functions to allow it to interact and guide customers, such as autonomous movement, the ability to detect human voices in noisy environments, functions to recognize objects based on data on the internet, and the ability to search for objects using multiple networked cameras within a facility as "eyes." EMIEW3 inherits the best of EMIEW2's abilities while adding new functionality of its own, and its announcement in 2016 is another milestone in robot evolution toward symbiotic coexistence with their human creators.

PMORPH2: A Robot to Investigate Fukushima Daiichi



Hitachi-GE Nuclear Energy, Ltd. (Hitachi-GE) is working toward the decommissioning of Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station. Since joining the International Research Institute for Nuclear Decommissioning (IRID), founded in 2013 with the aim of developing the necessary technology for this unprecedentedly difficult decommissioning project, Hitachi-GE has advanced its research and development efforts toward this goal.

In March 2017, PMORPH2—a robot to investigate the basement floor inside the Unit 1 Primary Containment Vessel (PCV) developed by Hitachi-GE in its role as a member of

IRID—was sent into the Fukushima Daiichi Nuclear Power Station Unit 1 PCV to investigate the condition of the fuel debris (melted and fallen nuclear fuel) within the vessel.* Based on technology developed by the Hitachi Group, PMORPH2 is able to pass through a narrow pipe roughly 10 cm in diameter, and has the unique ability to transform from a straight, thin shape like the letter "I" into the shape of the letter "U" in order to maneuver stably inside the PCV.

The investigation was carried out by taking measurements and photographs at five locations 10 times over five days. Due to sediment inside the PCV, it did not succeed in photographing the fuel debris itself, but the range of data it obtained will be used in future explorations of methods for removing the fuel debris.

* PMORPH2 was developed with the Subsidy Project of Decommissioning and Contaminated Water Management by Ministry of Economy, Trade, and Industry (METI).

Hitachi-GE Nuclear Energy, Ltd.

Satoshi Okada, PhD

Senior Engineer, Nuclear Equipment Design Department, Nuclear Engineering and Product Division

In highly radioactive areas, electronics are of limited use. As a result, when using a robot to investigate the PCV interior, the skill of the operator is also a vital element. The key to a successful probe is harmonious teamwork between human and robot. The road to decommissioning is daunting, but this investigation result has allowed us to take another step toward that goal. At Hitachi-GE, developers do not just improve by sharing and discussing ideas internally—they also collect information from around the world to use when developing new technology.



CASE 03 ▶ Water

OUR INSIGHT AND STRATEGY

Water is one of the focus areas for Hitachi's Social Innovation Business. Hitachi aims to become a comprehensive water service provider, responsive to the needs of the market and its customers. The water business unit seeks to resolve water-related issues by providing end-to-end solutions worldwide, from design and construction of purification, desalination, and sewage treatment plants to the building, operation, and maintenance of monitoring and control systems.

Changing Markets and Sustainable Development Goals

Demand for water resources is increasing rapidly, driven by population growth, economic expansion, and urbanization. The Organization for Economic Cooperation and Development estimates that by 2050 world water demand will have increased on the order of 55% in response to growth in manufacturing, thermal power generation, and home use. The market for seawater desalination plants in particular is expected to double in size by 2020.

Hitachi has supplied water-related products and systems to more than 200 sites in 40 countries and regions around the world. We are currently expanding globally, with focus areas including the ASEAN countries and India, where rising populations are fueling major market growth; the Middle East and Africa, where the need to secure drinking

water is acute; and North America, where increasing attention is paid to drought countermeasures.

Some water-related challenges are global in scope. Two of the United Nations' Sustainable Development Goals (SDGs) deal specifically with water: Goal 6, "Ensure access to water and sanitation for all," and Goal 14, "Conserve and sustainably use the oceans, seas, and marine resources." Hitachi is determined to leverage its technology to supply safe and affordable water to people throughout the world, provide sewage treatment and other sanitary facilities, and construct systems enabling more efficient use of water. Additionally, we will continue striving to reduce marine pollution and help achieve the SDGs.

Business Rollout in Response to Regional Needs

★ Seawater desalination/ advanced water treatment projects (including focus areas)

● ODA projects

■ Engineering bases

Activities

Expand business in seawater desalination and advanced sewage treatment fields (respond to needs through superior technologies)

Steadily promote and expand large-scale projects (ODA projects, partnerships using unique technologies)

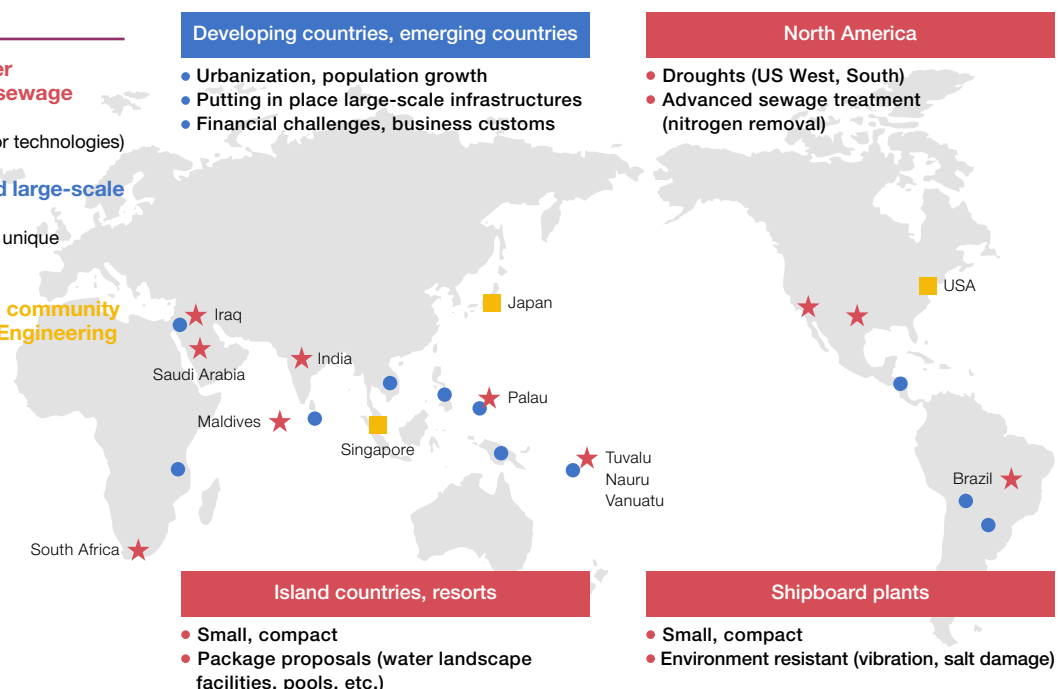
Roll out business with close community ties by strengthening Front Engineering (Singapore, USA)

Developing countries, emerging countries

- Urbanization, population growth
- Putting in place large-scale infrastructures
- Financial challenges, business customs

North America

- Droughts (US West, South)
- Advanced sewage treatment (nitrogen removal)



OUR ACHIEVEMENTS

As a comprehensive water service provider rooted in each individual region, Hitachi takes social issues into account when considering market and customer needs and supplying technology. It also promotes a variety of local initiatives, including participation in business planning and human capital development.

Enhancing Regional Autonomy Through Water Initiatives

Seawater Desalination Initiatives in South Africa

In 2016, at the request of the New Energy and Industrial Technology Development Organization (NEDO), Hitachi began an integrated seawater desalination and water reuse system demonstration project in eThekweni, formerly known as Durban, South Africa.

eThekweni is on the Indian Ocean coast and has a population of roughly 3.6 million. Its water shortages are due to the concentration of this population in urban areas and its lack of precipitation. Seawater desalination was the first potential solution to be investigated, but conventional systems require high-pressure pumps to force seawater through reverse osmosis (RO) membranes, and these pumps consume a great deal of electricity. With electricity costs rising sharply in South Africa of late, this proved a significant hurdle.

Meanwhile, Hitachi's interest in developing and accumulating operational and administrative knowledge about the water business, with a particular orientation toward international development, had seen the company work with Toray Industries, Inc. and other partners to establish the Global Water Recycling and Reuse Solution Technology Research Association in 2010. Under contract from NEDO, and in collaboration with the municipal government of Kitakyushu and other partners, Hitachi opened Water Plaza Kitakyushu, moving forward with pilot experiments for a new energy-efficient desalination technology Hitachi had developed and dubbed "RemixWater."

Kitakyushu had experience in the water business through public-private partnerships, particularly in Southeast Asia, and took the initiative in inviting researchers and observers from around the world to visit and study at Water Plaza Kitakyushu. Hitachi's RemixWater system was of great interest to the delegation from eThekweni, and the current demonstration project was the eventual result.

By diluting seawater with treated sewage, RemixWater reduces the desalination pump pressure, cutting the energy consumption of the system as a whole by around 30%. The burden on the environment is also reduced, with the water ultimately discharged into the ocean almost exactly as dilute as seawater. For this demonstration project, Hitachi will install a new RemixWater system in eThekweni's existing sewage treatment facilities, sufficient to desalinate 6,250 m³ of seawater per day—enough for around 25,000 people. The demonstration period is planned to last until November 2020.



A sewage treatment plant in eThekweni is the planned site of the RemixWater demonstration project.

Nurturing Young Engineers in South Africa

Hitachi believes that to resolve social issues like those identified by the SDGs, it is crucial not only to provide technology but also to nurture human capital rooted in each region. Since 2009, with the support of South Africa's Department of Science and Technology (DST), Hitachi has run the Hitachi-DST Scholarship Program for South African Engineers, which aims to support the development of young engineers in South Africa. Since fiscal 2015, Hitachi has contributed to the development of young human capital in South Africa by inviting around five engineers from the water treatment field to Japan each year, where they spend around two months observing Japan's cutting-edge advanced water treatment technology and participating in technical training at Hitachi's factories and other facilities.

Hope Joseph, a fiscal 2016 training program participant who is based in eThekweni, says, "Water Plaza Kitakyushu was very interesting as it showcased the RemixWater plant, which uses technology with low environmental impact—energy-saving as well as cost-effective. The program also changed my views as an engineer, making me realize that structured institutional mechanisms are required for the success of a project as well as technology." Joseph now holds presentations to share what she learned in Japan with her co-workers back home. There is great interest in South Africa in private initiatives to nurture human capital, and Hitachi's steps in this direction are welcomed warmly.



Workshop participants paying a courtesy visit to the mayor of Kitakyushu (Hope Joseph is fifth from the right).

The SDG Workshop in the Water Business Unit

To grasp the evolution of market needs from a perspective centered on the UN Sustainable Development Goals, Hitachi held an internal workshop for water business unit engineers, with external experts also invited to participate, on the theme "Expanding business potential by understanding needs from an SDG-centric perspective." One issue explored at the workshop was how the business should recognize regional social issues surrounding products and services, with seawater desalination in South Africa used as an example. Hitachi will continue to both raise awareness of the SDGs and develop its water business in order to help resolve social issues.