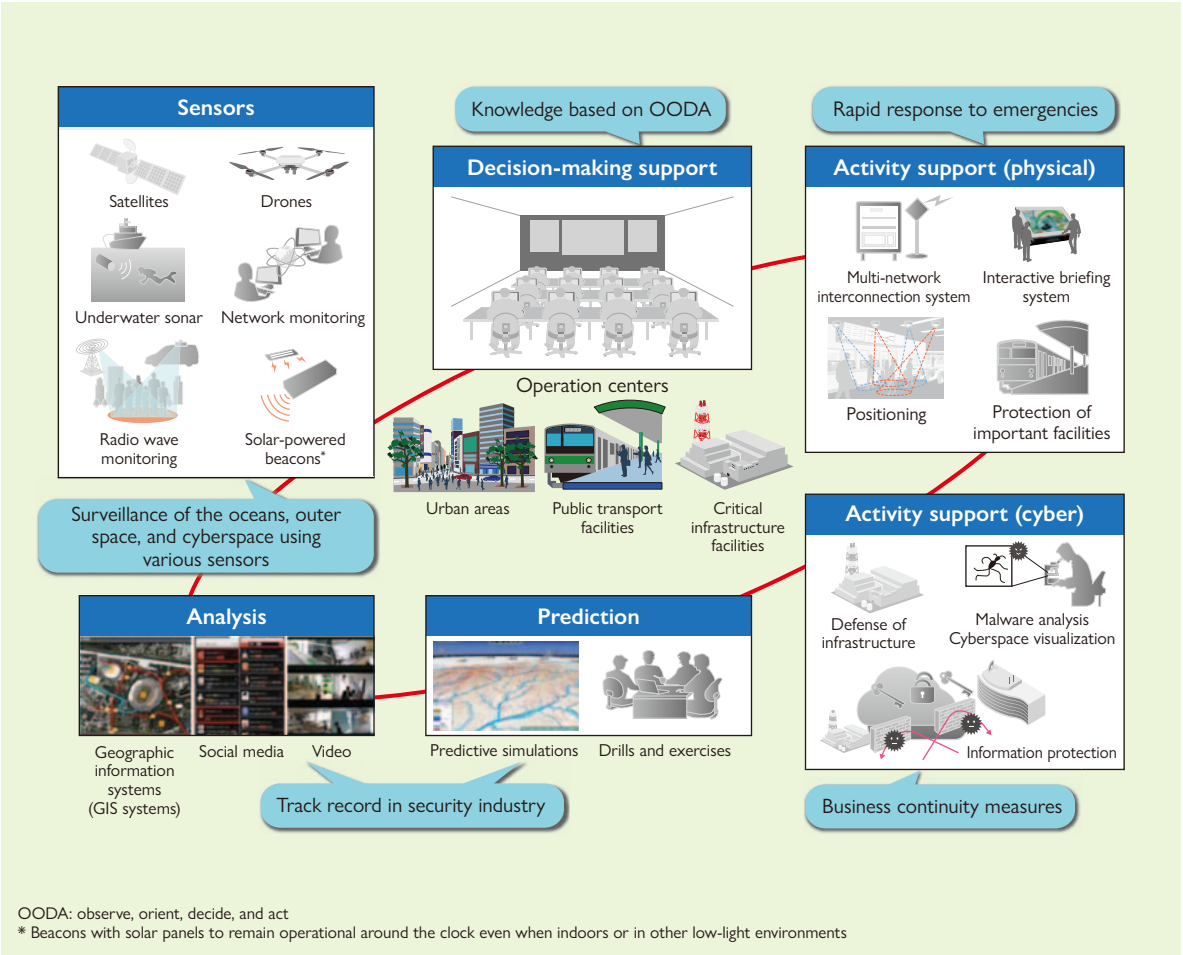
Security Technologies for Social Infrastructure

1 Wide-area Surveillance and Security Solutions

A number of security requirements are needed to protect public infrastructure such as urban areas, public transport facilities, and critical infrastructure facilities from threats such as natural disasters, cyberattacks, and terrorism. Hitachi has embodied these requirements in the H-ARC concept, named for the three characteristics of greatest importance—adaptive (A), responsive (R), and cooperative (C). Drawing on the H-ARC concept, Hitachi offers a wide-area surveillance/monitoring solution that functions as an effective crisis readiness measure and provides appropriate responses when crisis situations arise.

Specifically, the solution identifies constantly changing conditions in both physical space and cyberspace by using satellites, drones, radio wave monitoring, network monitoring, and other sensors to monitor public infrastructure from multiple locations while using real-time processing to automatically detect precursors of abnormal conditions. The surveillance information gained from these sources is used for analysis and prediction done with geographic information systems (GIS systems), imagery analysis, simulation technology, and other methods. These operations are used to assist in accurate decision-making



1 Wide-area surveillance and security solution

such as by providing knowledge related to the processes of the observe, orient, decide, and act (OODA) process. Rapid responses to crisis situations are also assisted by solutions providing positioning, information-sharing, and other functions.

The solution helps minimize damage by enabling drills and exercises that simulate actual crisis situations. Systems can be created rapidly by flexibly selecting equipment configurations tailored to the operation mode or existing facilities at the time of system installation.

2 Hitachi Drone Platform

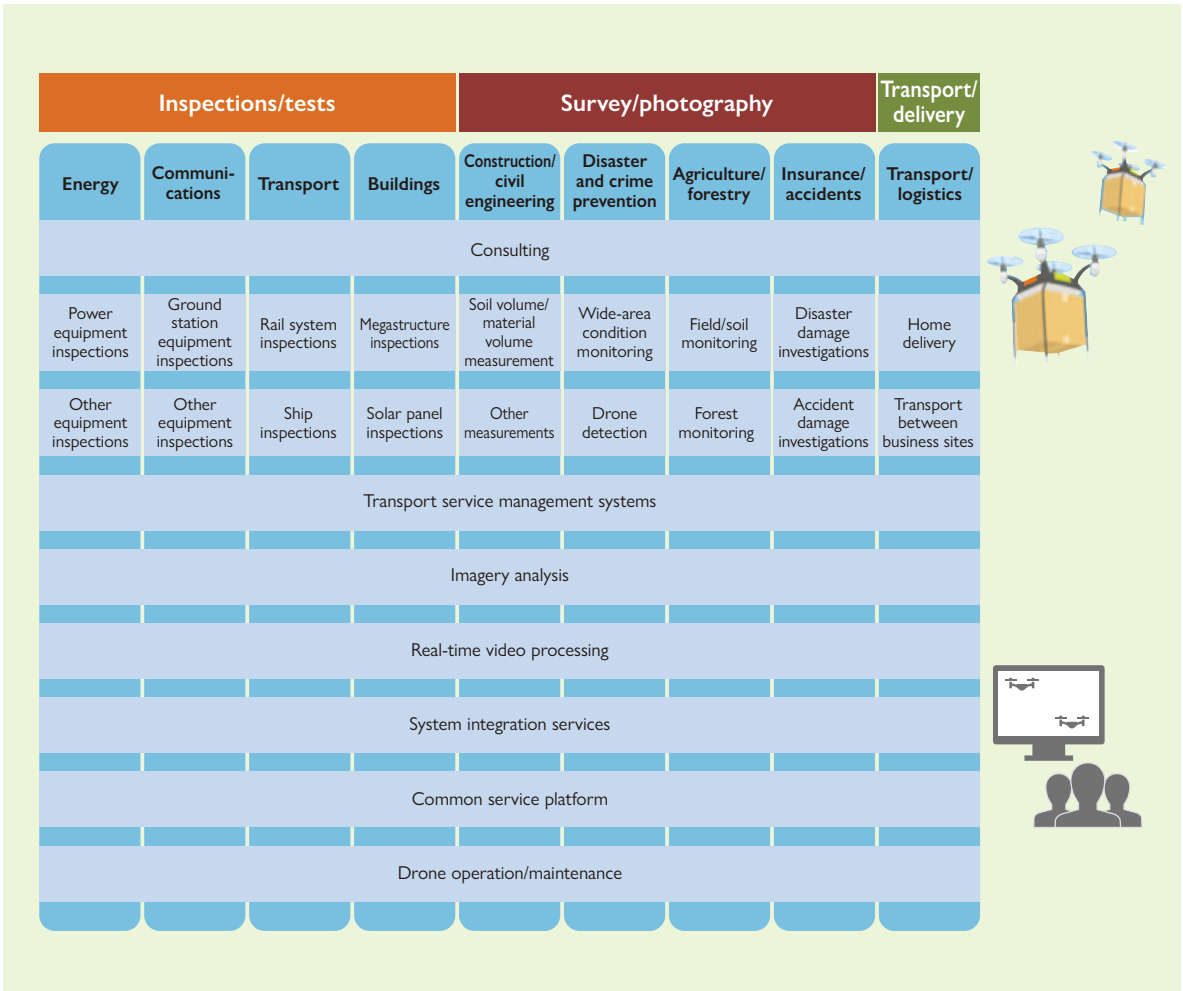
With their growing ubiquity in recent years, drones are now being viewed as promising tools for increasing business efficiency and achieving other benefits in a number of different industries. The Hitachi Drone Platform is a collection of several different technologies centered around artificial intelligence (AI). It is provided by the Hitachi Group as a coordinated effort among Hitachi, Ltd., Hitachi Systems, Ltd., and Hitachi Solutions, Ltd. It has the following four features:

(1) Optimum drone equipment support tailored to the client's usage objective

(2) A comprehensive range of services for optimizing client business, all from a single provider

(3) AI-based application services backed by extensive validation testing done with the client

(4) A Hitachi-produced transport service management system to assist with safe and secure autonomous flight



2 Hitachi Drone Platform

In August 2018, Hitachi was hired to develop a transport service management system for the Fukushima Robot Test Field (a test base for drone operation being created by the Fukushima prefectural government).

An environment incorporating legal and other aspects of drone use is being created through a number of activities that Hitachi will continue to assist. For example, the Company has provided policy advice through the Japan Unmanned System Traffic & Radio Management Consortium (JUTM)[*1], researched next-generation drones through the University of Tokyo, Sky Frontier Research Initiative[*2], and taken part in ISO[*3]-led activities for creating international standards.

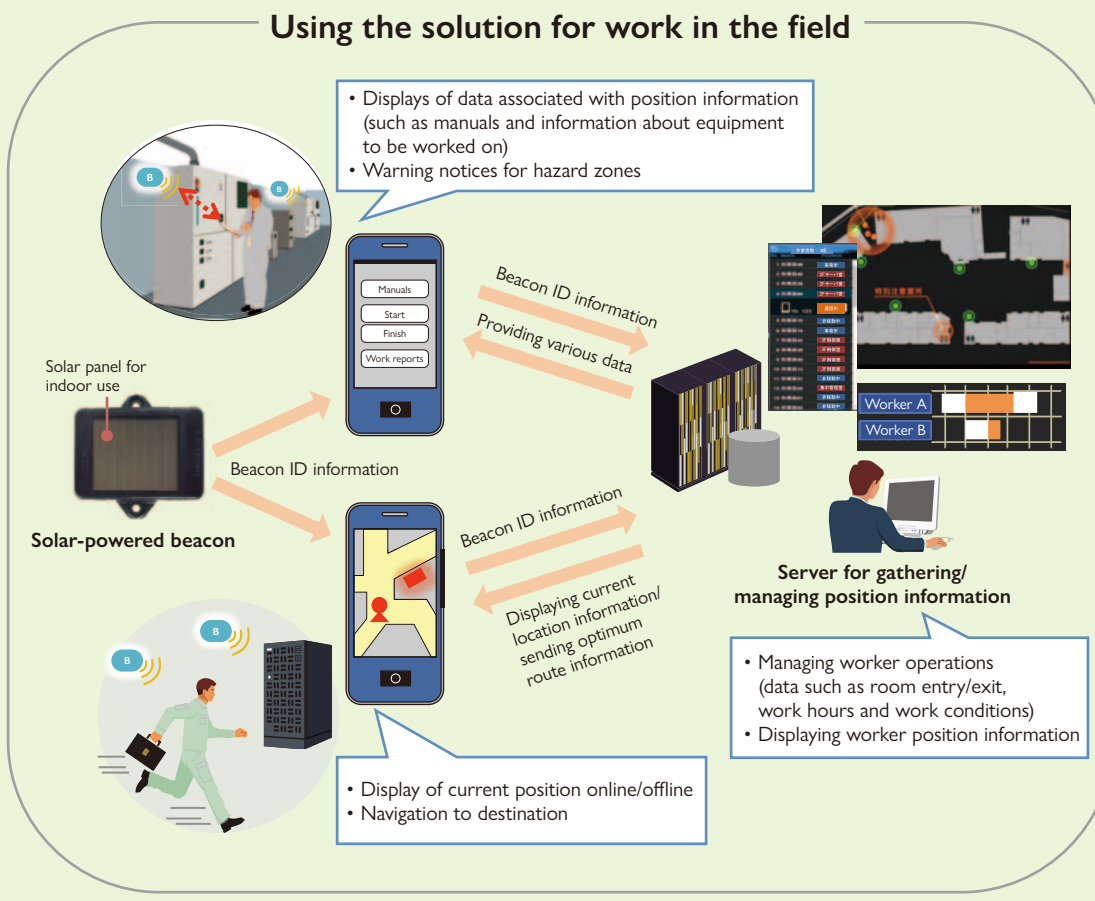
*1 A consortium of public, private and academic organizations that promotes the widespread use of drones. Hitachi serves as the administrative office.

*2 A research initiative created within the University of Tokyo's School of Engineering. Designed to promote the widespread use of next-generation drones. Began on October 1, 2018.

*3 International Organization for Standardization. An organization currently working on the creation of an international standard for drone systems to be codified as ISO/TC 20/SC 16 (Unmanned aircraft systems).

3 Indoor Positioning Solution Based on "Solar-powered Beacon"

Beacons are used as one method of acquiring position information from indoor locations out of range of Global Positioning System (GPS) systems. Since beacons are usually battery-powered, they require periodic battery replacement that can sometimes result in heavy workloads depending on the number and location of the beacons installed. Hitachi



B: solar-powered beacon ID: identification

[This technology was made possible in part by a project subsidized by the New Energy and Industrial Technology Development Organization (NEDO).]

3 Indoor positioning solution based on "solar-powered beacon"

has addressed this issue by developing a solar-powered beacon and using it to provide a positioning solution. Solar-powered beacons can generate the power it needs to operate from light sources as weak as indoor lighting.

When beacon identification (ID) information sent from a solar-powered beacon is received by a user's smart device, the positioning solution can provide the user with various data associated with that ID information. It can also perform functions such as displaying user position information and managing data indicating the amount of time spent at each location.

Solar-powered beacons can be installed in inspection areas of tunnels or other locations that have continual power supply difficulties or can't be adequately lit, for example. Worker smart devices can be used to collectively manage worker position information, work hours, and inspection records. By connecting the positioning solution to an existing maintenance system, it can also be used to identify past work conditions and manage work proficiency levels.

In structurally complex locations such as railway stations, underground walkways, and large commercial facilities, the positioning solution can provide navigation functions that let users easily find their way to their destination. It can also provide an information distribution function that improves user satisfaction by sending out information such as notices and coupons. Solar-powered beacon's power storage feature enables use for up to 72 hours on a full charge, making it useful during power failures or other emergencies for sending evacuation route guidance or short messages.

The benefits described here should enable Hitachi's positioning solution to help improve business management and work efficiency, while increasing the convenience of everyday life.