Security Technologies for Social Infrastructure
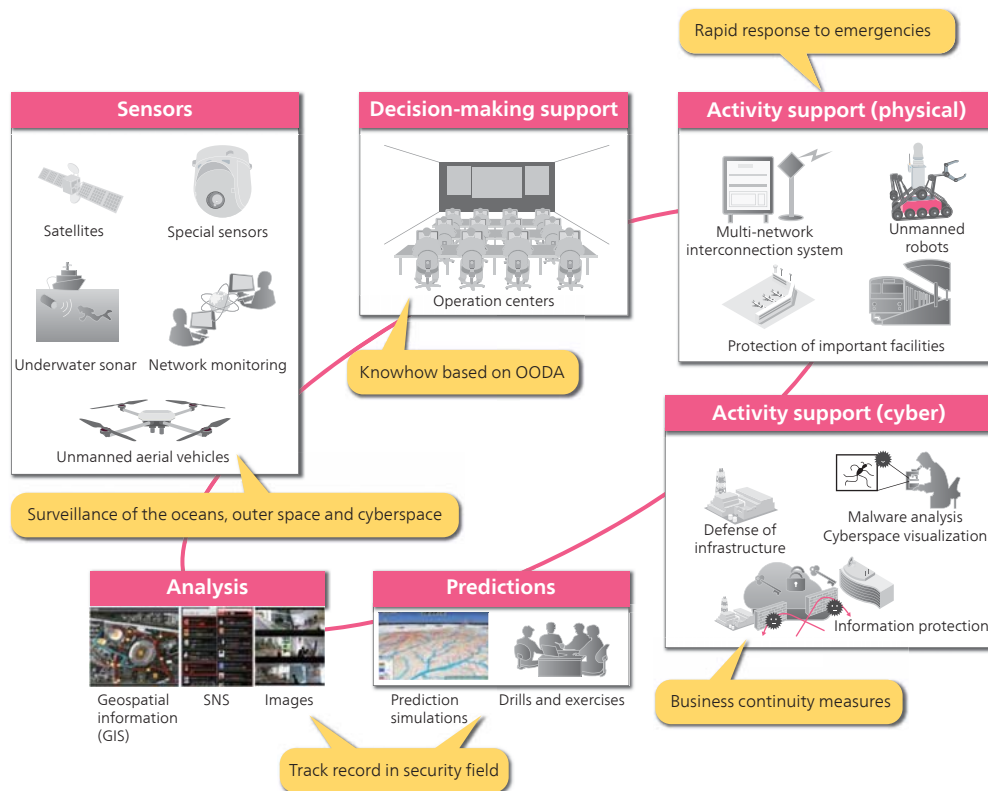

SNS: social networking service.

1 Security solutions covering the entire social infrastructure

1 Wide-area Surveillance and Security Solution

Hitachi uses the system security concept, which focuses on measures that are adaptive, responsive, and cooperative, to deal with security requirements for protecting social infrastructure, such as urban areas, public transport and major defense facilities, from threats such as natural disasters, cyber-attacks, and terrorism, and supplies a wide-area surveillance and security solution that provides appropriate ongoing measures in accordance with the International Organization for Standardization (ISO) 22320 standard for emergency management.
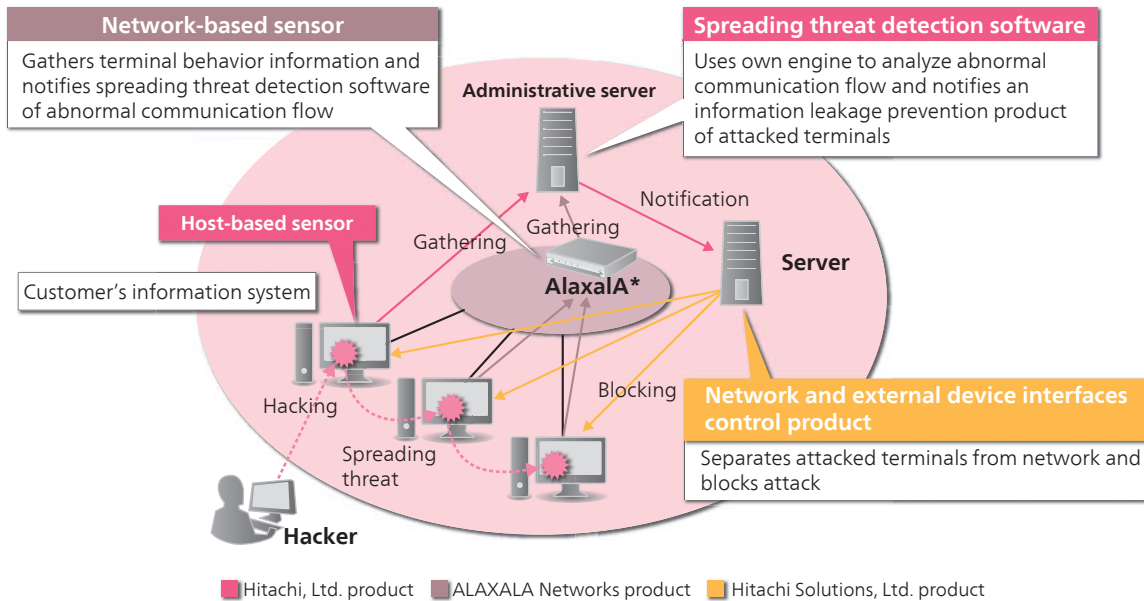
Specifically, it performs multifaceted monitoring of social infrastructure by using satellites, unmanned aerial vehicles, network monitoring, and other sensors to assess the ever-changing situation in both the physical and cyber realms. Along with using unmanned vehicles, security gates, and so on to provide physical support for activities, this includes analyzing and predicting information using geographic information system (GIS), analyzing image, and simulation techniques, and providing rapid and accurate decision-making support, including the provision of know-how based on the observe, orient, decide, and act (OODA) process.

It also supports prompt action through the automatic detection of warning signs identified by real-time processing of large volumes of collected monitoring data. The system can be configured and installed quickly thanks to a flexible choice of hardware configuration based on the nature of the operation and existing equipment.

2 Spreading Cyber Threat Detection Software

The damage caused by cyber-attacks, which have plagued society in recent years, is on the rise. An analysis of recent cases of damage shows that damage often occurs when systems are hacked despite the introduction of basic security measures. To cope with such threats, it

Network-based sensor

Gathers terminal behavior information and notifies spreading threat detection software of abnormal communication flow

Spreading threat detection software

Uses own engine to analyze abnormal communication flow and notifies an information leakage prevention product of attacked terminals

Administrative server

Host-based sensor

Customer's information system

Gathering Gathering Notification

AlaxalA*

Server

Hacking

Blocking

Network and external device interfaces control product

Separates attacked terminals from network and blocks attack

Spreading threat

Hacker

■ Hitachi, Ltd. product ■ ALAXALA Networks product ■ Hitachi Solutions, Ltd. product

* See "Trademarks" on page 162.

2 Spreading cyber threat detection solutions

is important to detect threats within organizations based on the assumption that systems will be hacked.
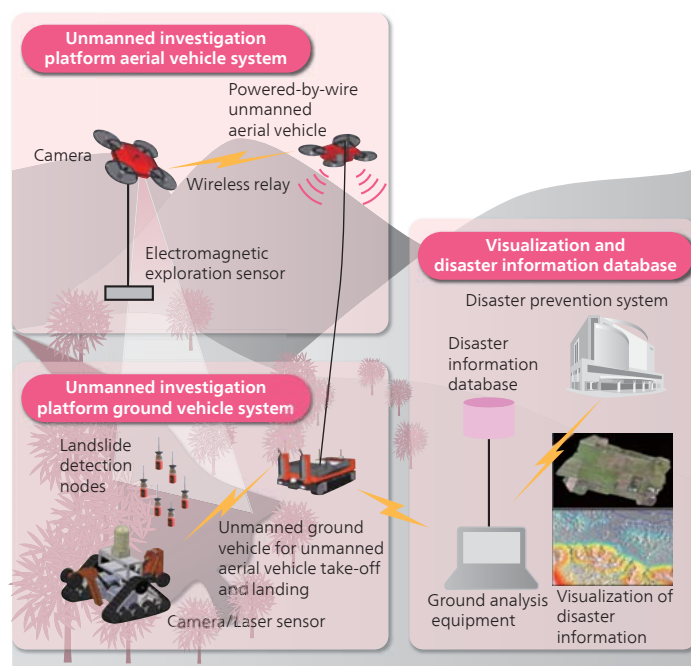
This software detects the spread of cyber threats within systems. It uses an independently developed machine learning engine to learn the normal behavior of each terminal and detect any terminal that behaves abnormally. The software also uses an engine that analyzes spreading attacks to see how a threat spreads from a terminal that is behaving abnormally to other terminals. The software is therefore able to detect internal threats through bird's eye view monitoring of

the entire network not just individual devices.

With this product as a starting point, Hitachi plans to use the knowhow it has accumulated in the cyber security field in a wide range of applications in the social infrastructure market.

3 Combined Air-ground Robotic System for Disaster Investigation

Since 2014, Hitachi has been conducting joint research with enRoute Co., Ltd., Yachiyo Engineering Co., Ltd.

Unmanned investigation platform aerial vehicle system

Camera

Powered-by-wire unmanned aerial vehicle

Wireless relay

Electromagnetic exploration sensor

Visualization and disaster information database

Disaster prevention system

Disaster information database

Unmanned investigation platform ground vehicle system

Landslide detection nodes

Unmanned ground vehicle for unmanned aerial vehicle take-off and landing

Camera/Laser sensor

Ground analysis equipment

Visualization of disaster information

3 Concept of combined air-ground robotic system for disaster investigation

and the National Institute of Advanced Industrial Science and Technology (AIST) in the field of disaster investigation robots as part of "The Sensor System Development Project to Solve Social Problems for Infrastructure Maintenance and Renewal" supported by the New Energy and Industrial Technology Development Organization (NEDO).

The aim of this R&D project is to use agile unmanned aerial vehicles (UAVs) to conduct aerial disaster damage assessments using topographic data, detailed images and such like, in places where there is a high risk of secondary disaster such as the site of a landslide, volcano or tunnel disaster, and to use unmanned ground vehicles (UGVs) to assess situation inside tunnels, etc.

In preparation for the practical application of such robots, Hitachi has taken part in a volcano disaster investigation in Sakurajima (Kagoshima Prefecture), a tunnel disaster investigation at the real-scale experimental tunnel (Ibaraki Prefecture) of the National Institute for Land and Infrastructure Management (NILIM), and a field-based verification of a landslide disaster investigation in the Akadani area (Nara Prefecture), and the UAVs and UGVs were rated highly by the Ministry of Land, Infrastructure, Transport and Tourism, which recommended their use.

Besides promoting the development and use of disaster investigation robots, Hitachi plans to promote the use of robots in routine infrastructure inspections to improve the efficiency and accuracy of inspections.

4 Acoustic Orthogonal Frequency Division Multiplexing Modem for Autonomous Underwater Vehicles

Technologies to investigate ocean mineral resources, such as seafloor hydrothermal deposits, cobalt-rich ferromanganese crusts, and deep-sea sediment with a high concentration of rare-earth elements (rare earth-rich mud), are being developed under a government-led initiative called the Cross-Ministerial Strategic Innovation Promotion Program (SIP) Next-generation technology for ocean resources exploration (Zipangu in the Ocean program)[1]. For exploration of the sea floor, the simultaneous deployment of multiple autonomous underwater vehicles (AUVs) is being examined, including the research and development of technology that would enable the simultaneous deployment of multiple AUVs over a wide area through the use of an autonomous surface vehicle (ASV) [2]. The ASV would replace the large, heavily equipped investigation vessel that served as the AUV mother ship in the past.

Leveraging its underwater acoustic technology, Hitachi is working with the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) to develop an acoustic orthogonal frequency division multiplexing modem to link the AUVs and the ASV. The aim is to develop a system capable of wireless communication in water depths up to 3,000 meters where radio waves and light cannot travel.

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[1] Next-generation technology for ocean resources exploration (Zipangu in the Ocean program)
http://www.jamstec.go.jp/sip/

[2] Cabinet Office of Japan, Director General for Science, Technology and Innovation Policy: Strategic Innovation Promotion Program (SIP) ... Next-generation technology for ocean resources exploration (Zipangu in the Ocean program) R&D Plan
http://www8.cao.go.jp/cstp/gaiyo/sip/keikaku/5_kaiyou.pdf
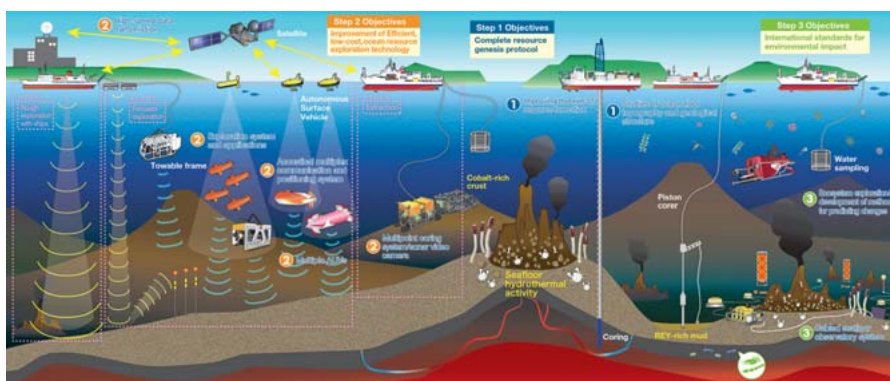
4 Conceptual drawing of Next-generation ocean resource exploration technology (Zipangu in the Ocean program)