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Citywide Protection Examples

Global Work on Protecting the Safety and Security of Cities

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OVERVIEW: Although life in cities equipped with a variety of social infrastructure and facilities is convenient, residents are exposed to a large number of threats, such as terrorism, crime, and urban disasters. Hitachi has compiled the requirements for protecting cities from these threats, and provides solutions for ongoing implementation of appropriate responses. This article describes some examples of the work that Hitachi has done in the USA and Singapore on technology and solutions in this area with features such as an integrated monitoring center that enables monitoring and response measures for entire cities, a vehicle screening system, and an explosives trace detection system. Hitachi will continue to help create safe and secure cities by providing robust and advanced security products and services.

INTRODUCTION

CITIES are convenient places to live since they are equipped with social infrastructure such as electricity, water, and public transport, along with a variety of facilities such as housing, offices, and commercial facilities. However, while residents enjoy the benefits of urban life, they are also exposed to a large number of threats including various crimes such as the seemingly endless series of international terrorist acts and enduringly common crimes such as phone fraud. There are also new types of natural disasters such as urban flooding caused by intense localized thundershowers.

Japan will soon host events that will be closely followed around the world (in 2019 and 2020), making it crucial for the country to determine how best to protect the safety and security of its cities as a whole. This article looks at Hitachi's work on addressing this issue.

SECURITY SOLUTIONS FOR PROTECTING CITIES

Hitachi has compiled a set of security requirements needed to protect cities from threats such as natural disasters, cyber-attacks, and terrorism, with the three concepts[1] of "Adaptive," "Responsive," "Cooperative". Hitachi provides security solutions by continually implementing appropriate security measures in compliance with the International Organization for Standardization (ISO) 22320 international crisis management standard (see Fig. 1).

Specifically, it performs multifaceted monitoring of social infrastructure by using monitoring cameras, access control systems, along with satellites, unmanned aerial vehicles, network monitoring, and other sensors to assess the ever-changing situation in both the physical and cyber realms. It provides action support through physical means such as robots and security gates, while analyzing and predicting information obtained by these means using geographic information systems (GIS), imagery analysis, and simulation technology. These activities and know-how based on the observe, orient, decide, act (OODA) process support rapid and accurate decision making. They also support prompt action through the automatic detection of warning signs identified by real-time processing of large amounts 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. (see Fig. 2).

Integrated Monitoring Centers that Protect Cities

Recent urbanization has resulted in the growth and diversification of the facilities and infrastructure composing cities, creating a need for integrated use

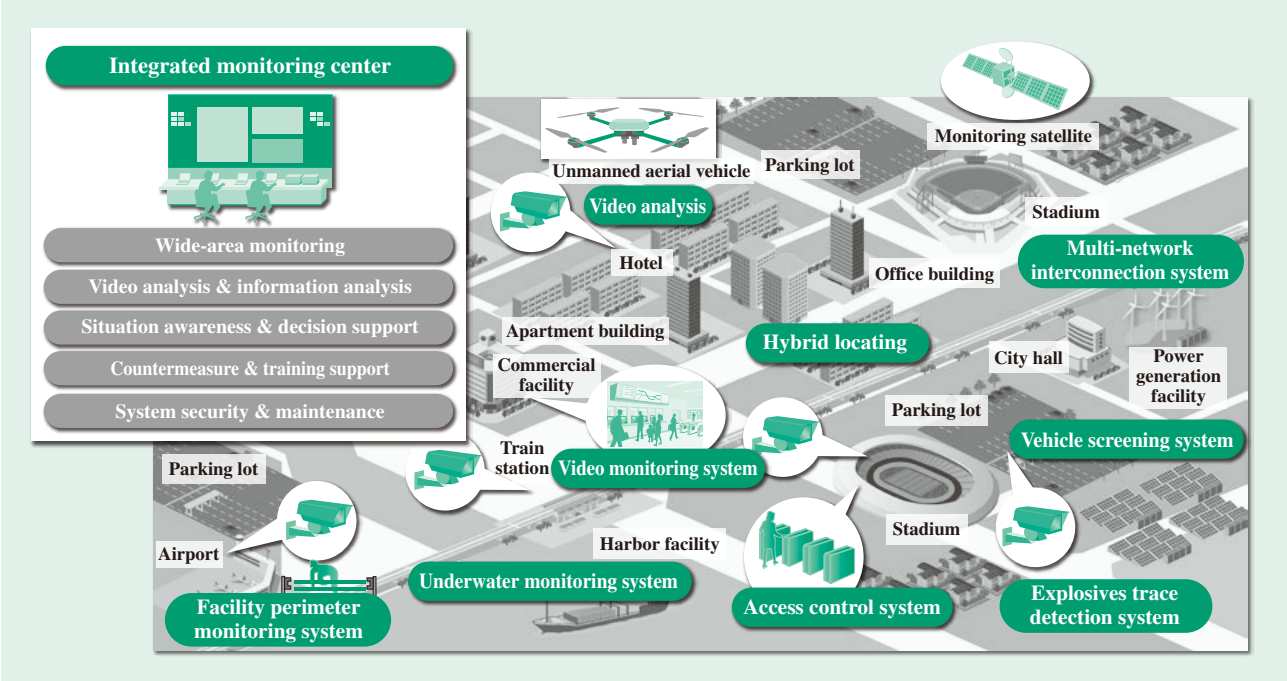

Fig. 1—Overview of Security Solution for Protecting Cities.
The security solution includes an integrated monitoring center that collects information from widely dispersed sensors (monitoring cameras and sensors in facilities and infrastructure control systems), which achieves situation awareness throughout the entire city. By analyzing and processing the collected information, the security solution achieves wide-area monitoring that assists with precise and rapid countermeasures.

of sensors and information to monitor facilities and areas that have so far been monitored individually. Hitachi provides integrated monitoring centers that perform integrated monitoring of an entire city as a single area, creating safe, secure, and comfortable lives for residents in areas including various facilities.

The centers achieve wide-area monitoring using various types of sensors interconnected by a common interface. The information from these sensors is analyzed to detect abnormalities in real time for use in preventing crime and in counter-terrorism. Decision support systems driven by GIS technology-

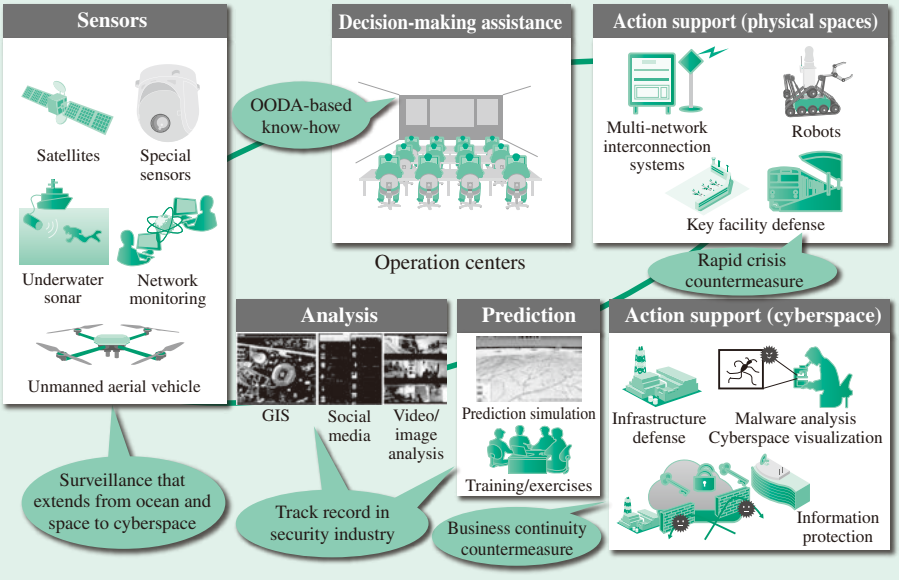

Fig. 2—Component Technologies of Security Solutions for Protecting Cities.
In multiple dimensions, from underwater to up in the sky, Hitachi can provide a variety of solutions that support both physical spaces and cyberspace.

based visualization and the OODA process enable precise situation awareness and decision making. Coordination with mobile terminals and various communication devices enables rapid processing of sharing information with sites and issuing of response instructions.

By detecting dangerous acts, suspicious persons, and suspicious items, the centers enable accident prevention, and by detecting people who have sudden illness or who need nursing care, they enable more rapid responses to situations and better service.

In addition to the normal operations of monitoring, analysis, decision making, and response, the centers also use simulation technology to help improve training and operation. Cybersecurity technology that prevents unauthorized access to sensors and integrated monitoring center systems ensures system safety.

Hitachi provides a complete lineup of services for these integrated monitoring centers and other large-scale monitoring systems, ranging from installation consulting to system integration.

Vehicle Screening System

At checkpoints on public roads and access control points at entrances to key facilities, officials check vehicle interiors and vehicle numbers, and inspect for hazardous items under vehicles. Hitachi provides a vehicle screening system that enables rapid and precise inspections under vehicles (see Fig. 3).

Using this system enables faster checks under vehicles than hand-mirror checks, enabling smoother vehicle passage. Under-vehicle inspection images can also be recorded and saved, enabling later use of the image data if needed.

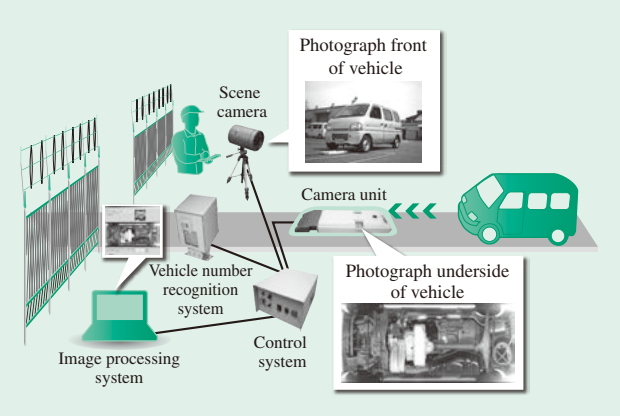

Fig. 3—Overview of Vehicle Screening System.
The system can be installed easily without preliminary construction, and enables smoother inspections for abnormalities under vehicles than hand-mirror inspections.

The vehicle screening system consists of a camera unit, control system, scene camera, vehicle number recognition system, and image processing system. The highly portable camera unit is designed with a size that enables passage of vehicles with low minimum ground clearances. The system has very high utility, enabling use just by placing it on the road, with no need for preliminary construction during installation.

The system was used for security since the Asia-Pacific Economic Cooperation (APEC) forum in 2010[2]. Its use at key facilities and a major international sports event in 2020 is anticipated in the future.

Multi-network Interconnection System

The facilities and infrastructure composing cities today each have their own communication networks, and are not sufficiently interconnected. To enable rapid and precise responses to situations, there is a need for information-sharing between integrated monitoring centers and sites, and information coordination among facilities and organizations. Means of communication that connect these communication networks together are becoming increasingly important. There is also a renewed recognition of the need for response measures that anticipate communication failures during major disasters.

Hitachi provides a multi-network interconnection system that provides wide-area voice and data communication by integrating different means of communication such as existing-infrastructure communication facilities, mobile phones, and radios (see Fig. 4).

The multi-network interconnection system provides seamless wireless and wired communication, incorporating unique communication protocols resembling radios that identify terminals by frequency or modulation type, and enabling normally impossible communication such as calls between radio and telephone equipment. By using the Internet protocol (IP) to integrate information from broadband wireless transmission equipment and existing communication infrastructure, the multi-network interconnection system can easily provide high-speed data communication of video information, etc. in addition to voice.

The system is a portable type that fits in a rack, so it can be transported by car, enabling easy construction of proprietary communication infrastructure in areas of communication failure during major disasters.

The system was used to enable rapid recovery of the communication infrastructure of Japan Air Self-Defense Force (JASDF) Matsushima Air Base, which

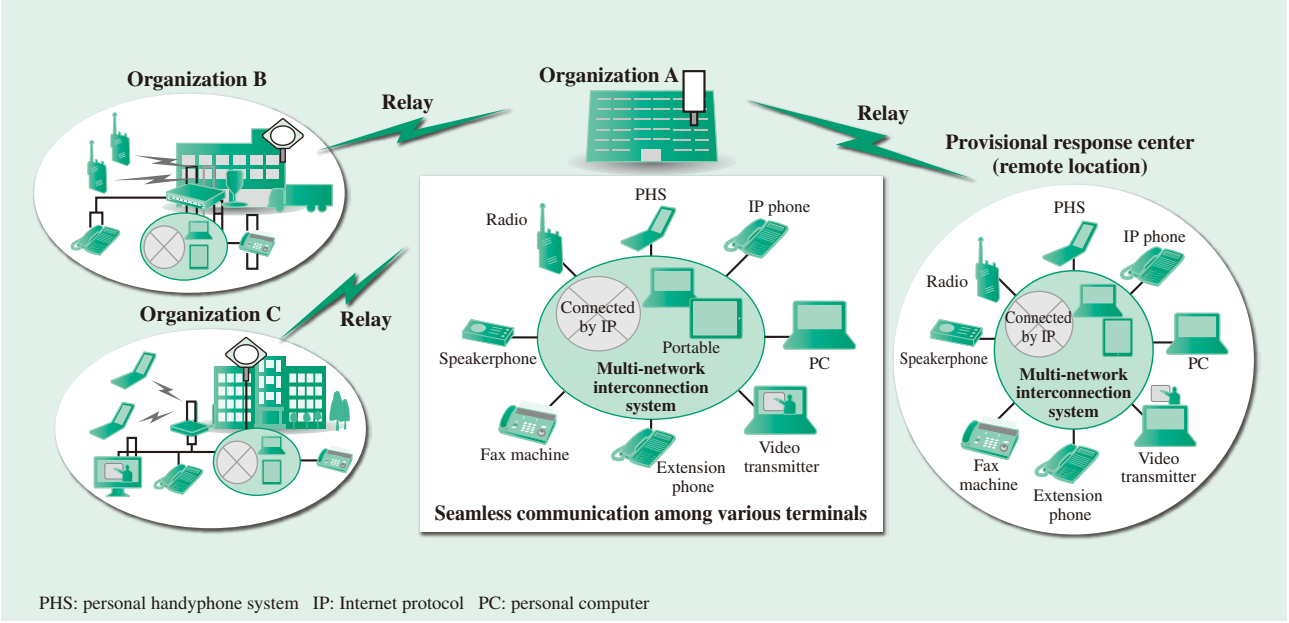

Fig. 4—Overview of Multi-network Interconnection System.
The system seamlessly connects both wireless and wired communication devices that use various communication protocols, such as mobile phones and radios. It enables easy construction of proprietary communication infrastructure.

was damaged during the Great East Japan Earthquake of 2011, and has since been used to construct various communication infrastructure[3].

Explosives Trace Detection System

Hitachi, Ltd. started developing a security gate with built-in explosives trace detection system in 2010 using "R&D Program for Implementation of Anti-Crime and Anti-Terrorism Technologies for a Safe and Secure Society", Funds for Integrated Promotion of Social System Reform and Research and Development of the Ministry of Education, Culture, Sports, Science and Technology, Japan[4]. This project was done in collaboration with University of Yamanashi and Nippon Signal Co., Ltd., and in 2014, Hitachi developed a prototype of the security gate which detected explosive particles with low false positive rate (<0.1%) within 3 sec after a subject passes through the gate. Those features were realized by using a high throughput particle concentrator and high efficient ionization source (See Fig. 5). The gate enables the inspection of all subjects passing through the gate, which cannot be realized by conventional wipe-sampling systems.

In 2015, Hitachi started a project for the commercialization of such gate for nuclear plants and plan to complete it in 2016. By expanding a lineup of physical security systems, Hitachi will contribute to realize the secure cities.

EXAMPLES OF OVERSEAS ACTIVITIES

Activities in the USA

In the USA, Hitachi provides the Hitachi Visualization Suite, public safety solutions that enable customers to grasp the situation rapidly and precisely through real-time displays created by integrating video from surveillance cameras with information from various

Fig. 5—Security Gate with Built-in Explosives Trace Detection System.
The explosives trace detection system was developed by Hitachi, Ltd., University of Yamanashi, and Nippon Signal Co., Ltd. in collaboration on the R&D Program for Implementation of Anti-Crime and Anti-Terrorism Technologies for a Safe and Secure Society and Funds for Integrated Promotion of Social System Reform and Research and Development from the Ministry of Education, Culture, Sports, Science and Technology, Japan.

Fig. 6—Map displayed by Hitachi Visualization Suite, Public Safety Solutions.
A video from surveillance camera is displayed on a map, along with information from various systems (such as the location where the crime was reported and license plates of nearby cars) and sensor information (such as gunshots). The display integrates these various types of information and enables public safety departments to get clear grasp of the situation.

systems and sensors. These solutions have been delivered to about 80 municipal police departments including the Austin Police Department as well as stadium/event agencies, and contribute citizen's safety.

For example, if a citizen calls the police to report a crime, the report details and reporter location are displayed on a map. This information is accompanied by video from surveillance cameras installed nearby, along with information from sensors (such as gunshot detection sensors). This enables police to get better situation awareness. Then police can assign their resources more efficiently and effectively (see Fig. 6). In addition, the system features Predictive Crime Analytics, which use historical data to give the police a likelihood that a type of crime will occur at a given time and place before it happens, to help the officers be in the right place at the right time to prevent the crime from happening.

Activities in Singapore

In Singapore, one of the safest countries in the world, the Economic Development Board and the Ministry of Home Affairs jointly set up the Safety & Security Industry Programme Office (SSIPO) to promote innovation capabilities in the safety and security industries. The SSIPO identifies challenges arising from homeland security and urbanization and creates opportunities for industry partners to develop and test new solutions in a live environment in Singapore.

Hitachi showcased its pioneering and cutting-edge technology on urban security solutions called Similar Face Search during the first testbed led by SSIPO in 2013-2014[(5)]. Also, its video content analysis and biometrics technologies will be candidates for validation through the second testbed planned by SSIPO from 2016 to 2020.

CONCLUSIONS

This article has described some of the work being done by Hitachi on protecting the safety and security of cities. It will continue to provide robust, advanced, and high-utility security products and services to support the safety and security of cities.

REFERENCES

(1) M. Mimura et al., "Hitachi's Concept for Social Infrastructure Security," Hitachi Review **63**, pp. 222–229 (Jul. 2014).
(2) National Police Agency, "2010 APEC Security," Focus Issue No. 279 (Mar. 2011), https://www.npa.go.jp/archive/keibi/syouten/syouten279/p22.html in Japanese.
(3) T. Sato et al., "Flexible Communication Infrastructure Using Existing Systems and Terminals," Hitachi Review **62**, pp. 174–179 (Apr. 2013).
(4) Hitachi News Release, "Development of Real-time Human Tracking Technology by Linking Walk-Through Style Explosive Detection Equipment and Surveillance Camera Network" (Dec. 2010), http://www.hitachi.com/New/cnews/101202.html
(5) Hitachi Asia Ltd. News Release, "Hitachi Asia Partners with AGT International-O'Connor's Consortium for Singapore's Safe City Test Bed Project," (May 2014), http://www.hitachi.com.sg/press/press_2014/20140528a.html

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