Featured Articles

IT Platform Solutions for the Social Innovation Business

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OVERVIEW: The ability to create new services that utilize the vast amounts of data now generated by infrastructure facilities has gained significant attention in recent years. At the forefront of this technical trend, Hitachi has been supplying highly reliable IT platform solutions that support innovation in business and society. Today, by utilizing the know-how acquired from these experiences and realizing sophisticated IT platforms that will be indispensable for the future evolution of social infrastructure, and which harmonize its accumulated operational know-how with ultrafast big data analysis, Hitachi is further advancing its contribution to the speedy supply of solutions and services to its customers and to society.

INTRODUCTION

SOCIETY is being transformed by the arrival of the Internet of things (IoT), which includes features such as automatic recognition and remote control, and is being created by providing communication functions and Internet connectivity, not just in mobile devices and information and telecommunications devices such as computers, but also in various other real-world objects.

Examples include smart meters, which provide electric power meters with communications capabilities and automatically report power use via the Internet; systems that can identify remotely when parts need to be replaced by fitting sensors and communications to large industrial machinery and using them to collect data on temperature, operation, and other parameters; and systems that collect location data from vehicles in realtime and provide information on traffic congestion. Interest is also growing in the creation of new services that collect, store, and analyze the large amounts of data generated by these social infrastructure systems.

With the ongoing development of systems that are able to collect, store, and process large amounts of complex data in realtime, the spread of cloud services, the explosive growth in smartphones and tablets, and the falling cost of sensors and communication devices, along with the information technology (IT) needed to provide these new services has started to become available over the last few years.

In response to this new environment, Hitachi announced its Intelligent Operations solutions in October 2013. Intelligent Operations is Hitachi's name for a range of product and service solutions that accelerate its Social Innovation Business. The aim is to provide a safe, secure, and comfortable way of life, and to achieve business growth through the use of information in order to innovate social infrastructure. In the field of control and operation technology (OT) in particular, this involves the use of IT to apply people's experience and intuition, which has traditionally been hard to pass on to others, and the results of analyzing large amounts of different types of data, which was thought to be beyond the capability of technology.

This article provides an overview of Hitachi IT platform solutions that use advanced IT to underpin the Intelligent Operations product range, and presents examples of their use.

PAST USE OF HITACHI IT PLATFORM SOLUTIONS

To provide a safe, secure, and comfortable way of life and to achieve business growth through the use of information in order to innovate social infrastructure, the IT systems that underpin this innovation must themselves be a reliable part of the social infrastructure.

For a long time, Hitachi has been a supplier of highly reliable IT platform solutions that support innovation in business and other parts of society. This has included using IT to support social infrastructure

in fields such as finance, government, and railways for over 50 years, such as in the development of a railway seat reservation system in 1959, and an online banking system in 1969. As a technology leader, Hitachi has also consistently developed IT platform products with the high reliability needed for mission-critical systems, thereby expanding the scope of products available for system development from mainframes to servers, storage, and middleware. Hitachi also supplies products and support services that draw on its expertise and capabilities for the long-term support of systems that operate 24 hours a day, 365 days a year in the form of products such as the Hitachi Unified Compute Platform (an integrated platform solution) and the Hitachi Cloud (a highly reliable cloud service).

In collaboration with the Institute of Industrial Science, The University of Tokyo, Hitachi has developed an ultrafast database engine that speeds up the use of big data, a field in which interest has grown rapidly in recent years. The database engine was released in June 2012 as part of a high-speed data access platform[*1] that includes Hitachi servers and storage. This makes it possible to keep up with the ever-increasing quantities of data, and provides a significant expansion in the scope of application, from conventional enterprise information systems to the realm of the IoT, with its use of large amounts of data from social infrastructure and various other real-world objects.

To develop future social infrastructure OT into a more advanced form, as described above, there is a need to combine technology for the ultrafast analysis of the large amounts of data from different types of equipment by using the operational know-how that has been built up through many years of experience. By using advanced IT to support OT in electric power, telecommunications, and other social infrastructure systems, Hitachi IT platform solutions represent a step toward achieving social innovation in a variety of different fields.

[*1] Utilizes the results of "Development of the Fastest Database Engine for the Era of Very Large Database and Experiment and Evaluation of Strategic Social Services Enabled by the Database Engine" (Principal Investigator: Prof. Masaru Kitsuregawa, The University of Tokyo/Director General, National Institute of Informatics), which was supported by the Japanese Cabinet Office's FIRST Program[*2] (Funding Program for World-Leading Innovative R&D on Science and Technology).

[*2] A national research and development program established to undertake world-leading research with the aims of boosting Japan's medium- to long-term competitiveness and underlying capabilities in fields such as industry and national security, and of ensuring that the benefits of research and development flow back to the public and society.

INTELLIGENT OPERATIONS SUITE AS IT PLATFORM SERVICES

Concept

High-speed processing of large amounts of data, long-term archiving, overcoming barriers of distance, accurate repetitive processing, and automatic execution are all inherent characteristics of IT. To date, IT has helped reduce business costs by utilizing these characteristics to perform fast and accurate information processing instead of human operation. In the future, other IT characteristics, such as predictions by the numerical modeling and numerical analysis of public or enterprise activities, and the visualization of complex systems by combining these capabilities, will become more useful by integrating and utilizing big data.

Today, the roles of IT include providing a platform for a safe, secure, and comfortable society by assisting the human intellections necessary for making rapid accurate decisions, and by contributing to increasing enterprise profit and social convenience. More specifically, by numerical modeling with big data of public or enterprise activities, such as production, transportation, and maintenance, situational judgment can be immediately rendered based on quantitative assessments of current circumstances. Furthermore, by utilizing numerical analysis techniques to which IT is well suited, such as combinational optimization or statistical prediction, it is possible to create the multiple possible action plans and to evaluate these alternatives in realtime. This makes it easier for enterprise executives or social constituents to choose the best action plan for maximizing revenue and convenience.

Until now, Hitachi has promoted various types of business with many customers on both IT solutions, such as market risk prediction for the financial firms or supply chain management for manufacturing industries, and operational solutions such as scheduling systems for railway companies and manufacturing execution systems for industrial plants. The Intelligent Operations Suite of Hitachi IT platform services provides these techniques and know-how as services combined with IT platform products (see Fig. 1), by extracting them as common models independently of the specific industries from which the experiences originated. In this way, Hitachi maximizes the delivered benefit and convenience by making it possible to predict and manage the complex behavior of the social infrastructure.
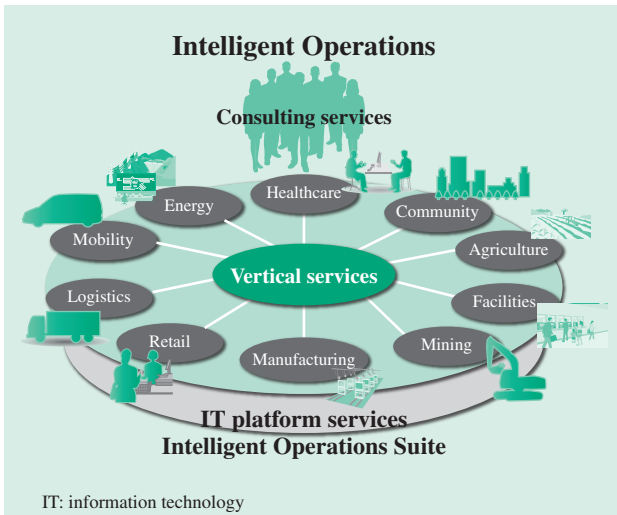
Fig. 1—Intelligent Operations Solutions.
The Intelligent Operations Suite provides IT platform services that underpin Hitachi's range of solutions.

Instances

This section describes an example of service using the Intelligent Operations Suite in the mining business to overcome management challenges and improve operations. The mining business can be roughly categorized into excavation, transportation, and shipping (see Fig. 2). In the excavation process, excavators dig out ore, dump trucks carry it to the crusher site, crushers break it down to the required size, and then loaders load it onto freight trains. In the transportation process, freight trains that consist of more than a hundred railcars transport ore to the shipping port, which may be more than 1,000 km away from the mine. In the shipping process, the ore is formed into piles temporarily at the port while awaiting the arrival of the ore ship. Once the ship has come alongside the designated pier, the ore is reclaimed from the stockpiles and loaded onto the vessel.

Because so many processes – from excavation to shipping – are involved, any accident or incident, such as a facility failure or the late arrival of an ore freight train due to bad weather, can have serious effects on all other processes, and can thereby cause delays in production and shipping schedules. Furthermore, planning and executing both temporary production schedules during repair work and procedures for resuming production impose a high workload. This wastes significant amounts of time and manpower, and can result in a major negative impact on profits.

When dealing with such anomalous situations, our services enable processing of the consecutive collecting, storing and analyzing of the sequential event data – concurrently with business activities – by utilizing IT features extracted from numerical modeling and analysis techniques that are integrated
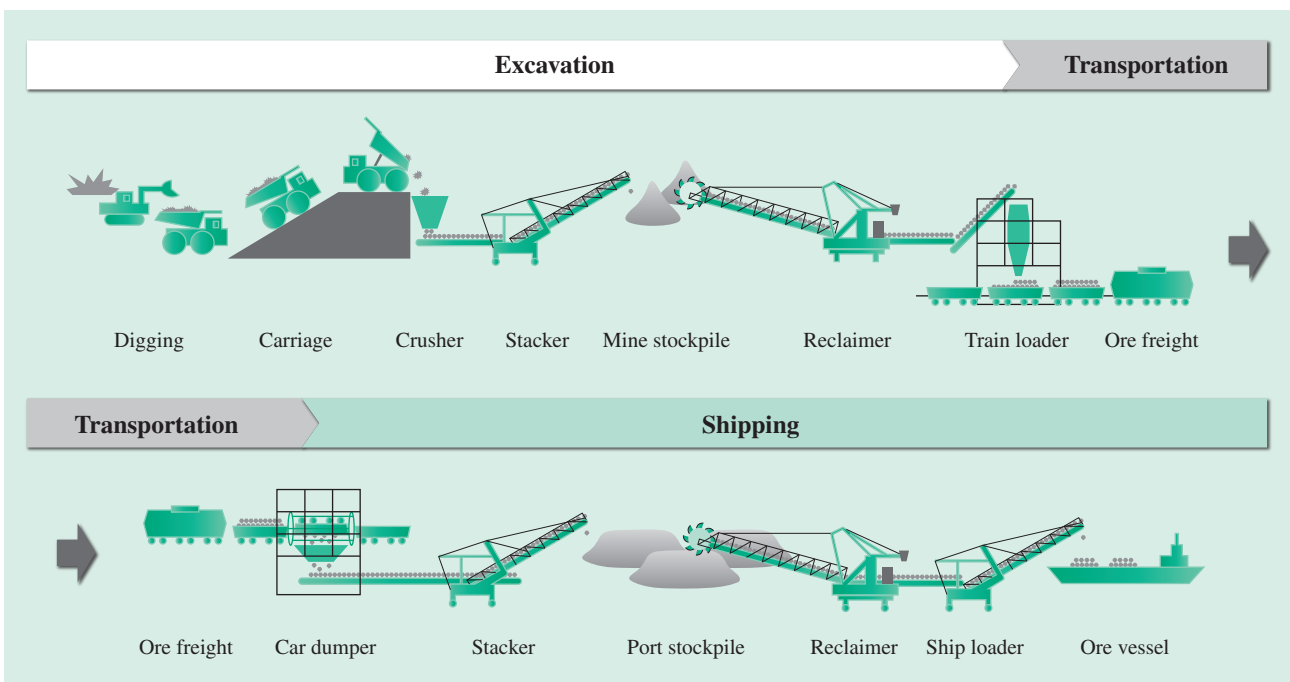

Fig. 2—Overview of the Mining Business.
Since the mining business consists of many processes, which can be categorized into excavation, transportation, and shipping,
a single accident occurring somewhere in the many processes has the potential to seriously disrupt all other processes.

with IT platforms, such as the high-speed data access platform. This can dramatically reduce the required intellection frequency and the time that is required for planning the production schedules and comparing them with alternatives, and makes it easier to create production schedules minimizing the impact on profitability.

For example, for minimizing the affect of train delays and creating procedures for resuming shipments, Hitachi's railway scheduling support systems, the utility of which has been proven by numerous railway companies in Japan, can be utilized to generate schedules for resuming operation with minimum delay, while simultaneously preserving the physical constraints (such as the number of locomotives and wagons or the facility locations for interchanging trains) and operational constraints (such as train crew assignments and their boarding times).

Similarly, for rescheduling shipment plans against ship loader difficulties, Hitachi's supply chain management systems, the effectiveness of which has been proven by numerous manufacturing factories in Japan, can be utilized to create the shipping plans that will minimize delivery date impacts by generating stockpiling plans during the trouble and scheduling shipment restart dates after the problem is resolved, as well as by supporting the extraction of bottleneck factors and planning countermeasures against them.

Additionally, Hitachi has numerous achievements related to supporting various customer business activities, including workflow management systems, document management systems, and asset management systems, and so on. It can thereby contribute to the improvement of operations and the enhancement of profit in the mining business by providing its Intelligent Operations Suite, which fully utilizes its practical know-how and the processing logics acquired through such achievements together with the middleware IT platforms and hardware that support reliable high speed processing.

IT PLATFORM SOLUTIONS FOR THE SOCIAL INNOVATION BUSINESS

The above example from the mining industry involved generating production schedules with minimal impact on profitability through modeling and the combination of ultrafast big data analytics (which could not have been performed manually) with the experience, intuition, and the application of know-how that only people can provide. To apply this experience

to social innovation in other areas, it is necessary to examine the factors that differ between countries and regions, industries, and business sectors, including the frequency and quantity of generated data, the feedback cycles required by management, and the required output quality. The Intelligent Operations Suite of IT platform services is designed to provide a high level of flexibility and scalability in the data collection, storage, processing, search, and other basic functions required for using big data in order to take account of the best frequency, granularity, and other requirements for data collection identified through experience.

Hitachi has also been working to develop various forms of technology for social infrastructure systems and to optimize them, in terms of operational efficiency and in other ways, by applying the knowledge of staff with practical experience. By using the Intelligent Operations Suite to link information systems and social infrastructure systems, Hitachi intends to provide speedy decision-making and the optimization of business and other social infrastructure systems in the future by integrating business and operational data that, in the past, had been collected and stored separately, and using that data as a basis for data visualization and analysis.

CONCLUSIONS

This article has described the IT platform solutions that support Hitachi's Social Innovation Business. While working on innovation in IT and collaborating with users, Hitachi also intends to support social innovation in various fields of business and other social activity around the world.

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