FOCUS

Digital Solutions Transforming the Manufacturing and Distribution Sectors
Leading Initiatives Aimed at Making Industry Smarter

The "Connected Industries" concept announced as representing a vision for new industries in Japan encapsulates that future as "using the interconnection and utilization of data to overcome challenges through technological innovation, productivity improvement, and skills transfer. It is expected to promote initiatives that will accelerate the development of smart industries in what can be described as a progressive emergence of new services and innovations. As it seeks to further advance its Social Innovation Business, Hitachi is working to develop a variety of services and other solutions aimed at making industry smarter in ways that help overcome challenges. This article describes some leading initiatives that are expanding the digital solutions business in the manufacturing and distribution sectors.

OTA Management Service for Vehicles

With the increasingly rapid growth in vehicle connectivity, Hitachi has embarked on an effort aimed at supplying an over-the-air (OTA) software update solution for vehicles. OTA is a technology used for updating the software installed in in-vehicle devices, such as an in-vehicle electronic control unit (ECU) used for vehicle control.

While timely software updates are essential for improving vehicle quality and adding new functions, past practice required vehicles to be brought to a dealer where a mechanic would perform the upgrade using a special-purpose device. With OTA, by contrast, a data center called an "OTA center" distributes the update data and updates the vehicle's software. Since applying OTA to vehicles requires both a high level of reliability and a short update time, Hitachi has developed a differential upgrade technology to make updates faster, a recovery technique for use when an update fails, and an end-to-end secure distribution technique

Figure 1 | OTA Management Service for Vehicles
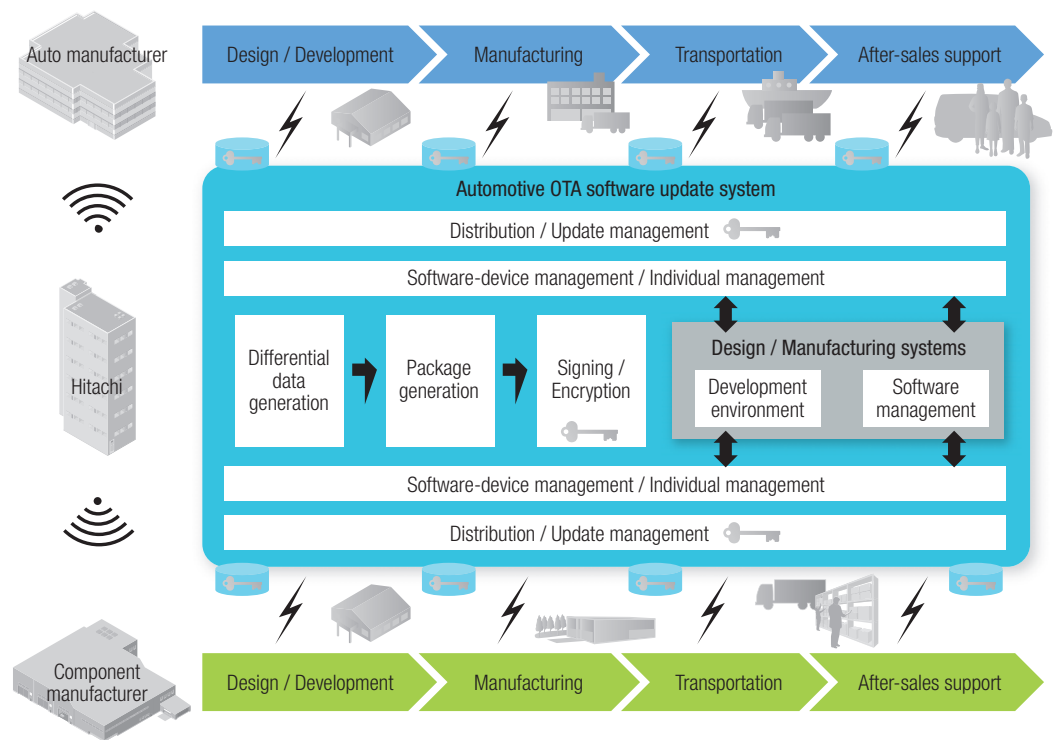
OTA: over-the-air

that provides multi-layered protection for transmitting update data from the OTA center to the vehicle. It has also constructed a total system extending from the OTA center's system to the ECU being updated. Hitachi intends to accelerate its efforts toward implementing its OTA management service in the future (see Figure 1).

Enhanced Driving Safety through Utilization of Driving Data

Initiatives for improving operational efficiency and developing new business opportunities made possible by the ability to collect data from a wide variety of devices are accelerating as a consequence of advances in the Internet of Things (IoT).

Yamato Transport Co., Ltd. has decided to progressively equip its fleet of delivery vehicles with a new in-vehicle terminal that features communication capabilities as well as a combined drive recorder and tachograph. The company is also working in collaboration with Hitachi on initiatives that include using the efficient and extensive

Figure 2 | Enhanced Driving Safety through Utilization of Driving Data
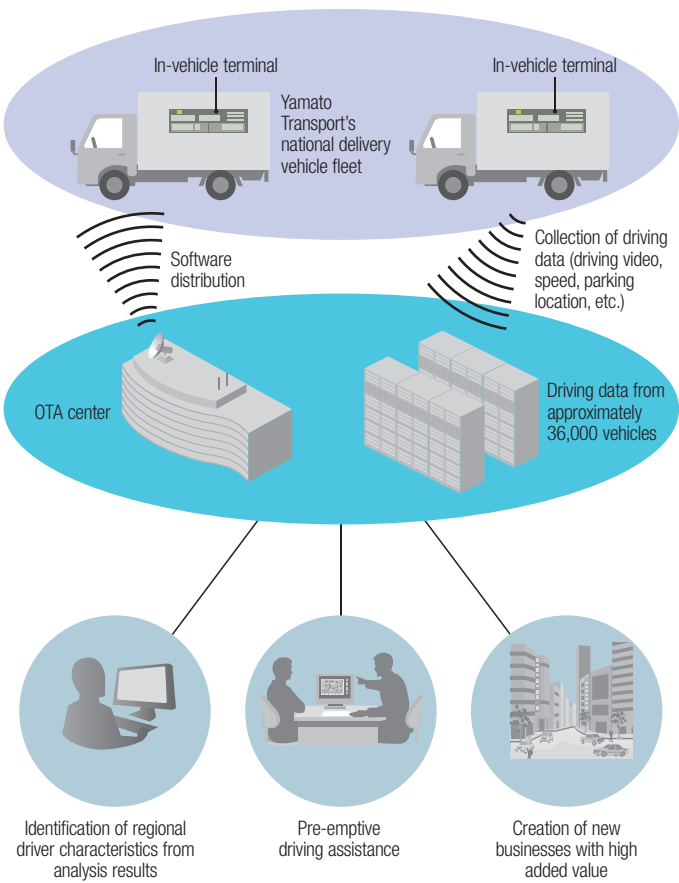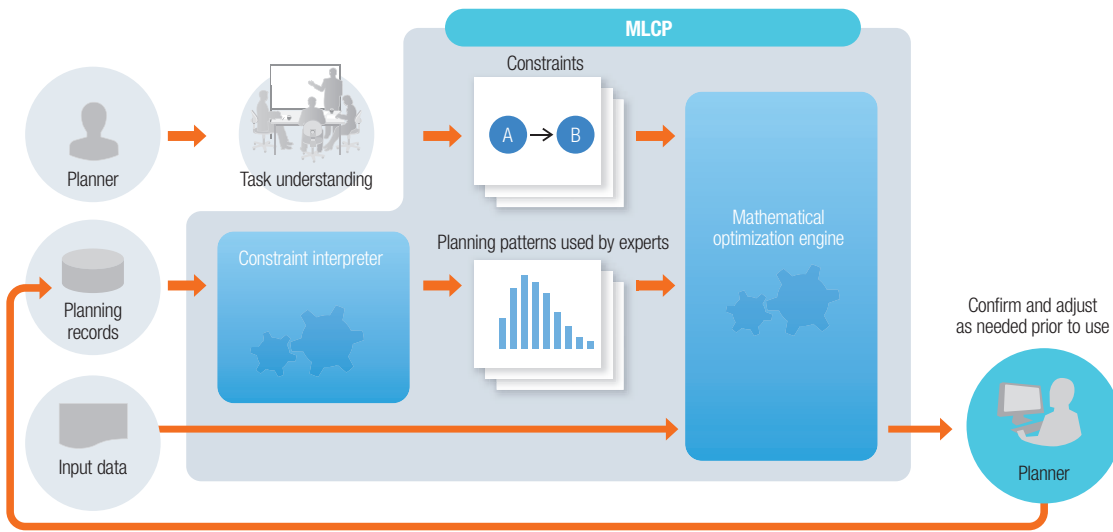
Figure 3 | Hitachi AI Technology/Plan Optimization Service

MLCP: machine learning constraint programming   AI: artificial intelligence

collection and analysis of driving data to enhance its driving safety training (see Figure 2).

Developed jointly by Yamato Transport and Hitachi, the in-vehicle terminal automatically transmits driving data to a cloud-based information platform in real time for archiving. In addition to data that was already being collected, this also includes video from the drive recorder and a record of vehicle movements generated from information collected using a global positioning system (GPS) antenna. The system also helps the driver focus on driving safely by automating the recording of dangerous locations, eliminating the need to manually specify journey start and end, and handling software updates of in-vehicle devices automatically using OTA technology.

Utilization of AI in Formulating Production Plans

With the shortage of skilled workers being exacerbated by the falling population of working age people over recent years, there is a need to utilize artificial intelligence (AI) and other technologies to automate tasks and to transform expertise into digital form in order to improve work efficiency and hand on skills, especially in manufacturing, where tasks that depend on expert workers are common.

Hitachi has launched its Hitachi AI Technology/ Plan Optimization Service that formulates optimal production plans automatically based on inputs that include production line data and the work records of experts. It does this using Hitachi's own constraint programming technology which integrates AI and mathematical optimization techniques proven in railway traffic management and other applications. The service performs combination and analysis to generate optimal production plans for products that involve multiple variations and processes, using as a basis the distinctive planning patterns of experts identified by machine learning from data that includes complex constraints and extensive planning records. Along with significantly reducing the amount of work needed for formulating and revising plans, such as by providing the flexibility to rearrange production plans in response to fluctuations in demand and other conditions that change on a daily basis, the service also supports the transfer of production planning skills (see Figure 3).

The service was used in trials run jointly with Nippon Steel & Sumitomo Metal Corporation that demonstrated its ability to replicate certain aspects of production plans prepared by experts.