

New SaaS-based Operations Management System to Realize Safe Driving Support and Improve Transport Quality: Logifit TM-NexTR

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Logifit TM-NexTR, a new operations management system based on software as a service (SaaS), is a product of Fujitsu's logistics solution "Logifit" Series and is responsible for operations management. Logifit TM-NexTR is a next-generation product developed based on Fujitsu's know-how acquired with the TRIAS Series, which has a proven track record as an operations support system that uses a digital tachograph. Operations that can be managed with Logifit TM-NexTR include arrival management from the perspective of customers such as consignor and delivery destinations, not to mention conventional operations management and movement management. Introducing Logifit TM-NexTR makes it possible to link a vehicle with various sensors through Fujitsu's Internet of Things (IoT) technology. This in turn helps to support safe driving and improve transport quality at a lower cost than the conventional digital tachographs. This paper describes the background to the development of Logifit TM-NexTR and presents examples of utilizing the IoT in Logifit TM-NexTR.

1. Introduction

Activities for improving the safety and quality of transport and delivery are being strengthened especially among logistics operators. Safety here refers to support for safe driving, and quality to punctual delivery, maintenance of appropriate temperatures during transport, prevention of cargo collapse, and such like. In recent years, road conditions have been changing in short periods of time due to abnormal weather such as localized torrential rain and unprecedentedly heavy snow, and this often leads to a failure to deliver cargo.

Meanwhile, in the world of the Internet of Things (IoT), the significant progress of functions and communication performance of smart devices has put in place an environment where large volumes of information can be processed on-site for transmission. We have built a solution that ensures the safety and quality of transport and delivery without imposing burdens on drivers. It utilizes smart devices and links them with various sensors, devices, and smartphone applications.

This paper describes the linkage between smart devices, and various sensors in the present solution built by Fujitsu and presents the technology and functions for improving safety and quality that have been

realized.

2. Existing situations and issues

The recent diversification of consumer needs and the trend toward reduced inventories of retail companies have been making shipment lots smaller and deliveries more frequent. In Internet retail, in particular, next-day or same-day shipping is expected and logistics operators are required to further improve the transport efficiency.

Meanwhile, people's awareness of the need for safety and security has been increasing recently, and this has given rise to a need for transport quality management (especially management of delivery times and temperatures of cargo items or cargo compartments during transport). Many consignor companies that outsource logistics are demanding that the consignee logistics operators introduce a system capable of managing delivery statuses. In addition to the Great East Japan Earthquake in 2011, which is still fresh in our memory, as a striking example, the heavy snow in February 2014 (2014 Heavy Snowfall in the east Japan area) caused a situation that made many logistics operators incapable of grasping the delivery statuses

and they were absorbed in fulfilling their accountability to customers. As a result, delayed deliveries and other problems led to food being thrown away and the accompanying penalties (damages for breach of contract). Since these disasters, requests for proposals of systems relating to the management of delivery statuses and transport quality have been growing rapidly.

Based on past experience, Fujitsu has recognized the issues facing consignor companies and logistics operators as described below.

- 1) Issues facing consignor companies
 - Delivery statuses cannot be grasped in real time. Solutions for grasping movements intended for logistics operators exist but not from the perspective of the consignor.
 - Re-consignees cannot be managed. Consignee logistics operators may have re-consignees in some cases and complete management is difficult.
 - Traffic accidents cannot be decreased. To improve the corporate image, safe driving should be ensured with vehicles bearing the corporate logo. However, a digital tachograph, which is a device used for driver management, is expensive and introducing the management system is difficult for logistics operators.
 - Temperature management is not ensured and accidents such as rotten products may occur.
- 2) Issues facing logistics operators
 - The investment may be overlapping in some cases with a management system introduced into the company on its own in addition to another management system introduced to meet the request from the consignor.
 - At present, to deal with inquiries from consignors and delivery destinations, statuses are checked with drivers by calling them on a mobile phone each time and recorded on whiteboards, etc. This requires a similar system to be established for each shipping base, and hence it increases the cost burden including the labor cost.
 - Because of the inability to decrease the number of traffic accidents, the burden of high insurance premiums becomes heavier, which increases the number of lost sales opportunities.
 - Smaller shipment lots and higher delivery frequencies mean there is a greater demand for

drivers and logistics companies to observe the delivery times.

3. Method and technology to resolve issues

As a means of resolving the issues mentioned in the previous section, Fujitsu worked on developing an operations management system that makes use of smart devices as management terminals. The reasons for employing smart devices are as follows.

- 1) Lower prices than dedicated devices

As devices for operations management, dedicated in-vehicle units such as digital tachographs are commonly used. However, models equipped with operations management and safe driving support functions at a certain level are expensive and those priced at about 300,000 yen per unit are the mainstream.

- 2) No need to install on vehicles

Because of the smaller shipment lots and higher delivery frequencies, the quantities of cargo may greatly vary depending on the season, month, week or day of the week. In addition, the kind of cargo to be transported may vary on a day-to-day basis, and this leads to day-to-day changes of logistics operators in charge of delivery and the number of vehicles required. Smart devices with portability can realize flexible operations without the need for fixed vehicles or drivers.

- 3) Expanded choice of peripheral devices

As smart devices become widespread, there is an increasing variety of peripheral devices and sensors available that are connected by Bluetooth or other technologies. Hence, it is now possible to improve transport quality by using temperature sensors, and support safe driving by using vehicle information (such as vehicle speed and engine speed) and vital sensor information.

4. Features and functions of Logifit TM-NexTR

In August 2015, we launched Logifit TM-NexTR⁽¹⁾, a new operations management system based on software as a service (SaaS) that employs smart devices as the management devices. Logifit TM-NexTR is a next-generation product developed based on Fujitsu's know-how acquired with the TRIAS Series, which has a proven track record as an operations support system that uses a digital tachograph. It is available in the

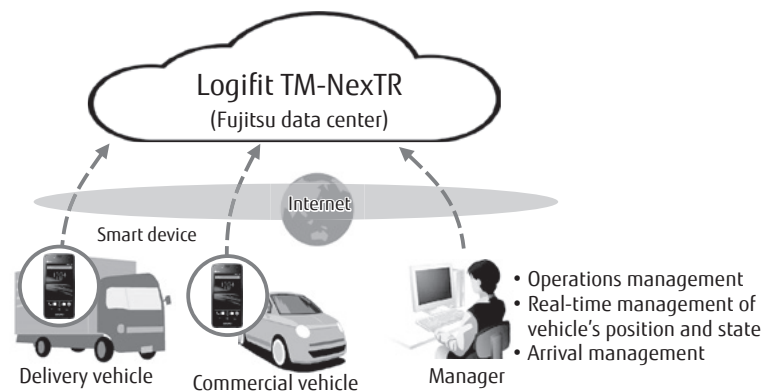


Figure 1
Conceptual image of Logifit TM-NexTR service provision.

cloud service and as an on-premises type (Figure 1).

The following describes the functions provided for Logifit TM-NexTR.

1) Sharing of smart devices

Smart devices with high portability have the benefit of not needing to be allocated to vehicles or specific drivers, and this has made it possible to share smart devices between different transport companies. In terms of the movement management system, the movement information of multiple transport companies can now be managed in a centralized way.

With this feature utilized, the product has been adopted for the verification testing of relay transport intended for eliminating irregular and long working hours, on which the Ministry of Land, Infrastructure, Transport and Tourism is working (Figure 2).

2) Capability of information disclosure on the Web

The conventional operations management systems were intended for transport companies to manage operations of their own vehicles. By contrast, this product provides a system that assumes as the user not only transport companies but also consignor and delivery destination companies. From the perspective of consignor companies, it allows the user to check on the delivery statuses of the cargo consigned. From the perspective of delivery destination companies, the delivery statuses of the cargo to their centers can be checked in detail. For cargo to be delivered from more than one consignor, control is provided to hide any information about the delivery destination or delivery route that is not allowed to be seen by the delivery destination under the contract.

3) Support with safe driving by making use of sensor information

By connecting with an on-board diagnostics-II (OBD-II) connector that can acquire vehicle information (such as the vehicle speed and engine speed), safety-related information including excessive vehicle speed, abrupt slowdowns, and long-hour driving can be given to the driver in real time. In particular, for ordinary commercial vehicles of less than 3.5 t in deadweight, for which installation of a digital tachograph is not obligatory, smart devices can be used to realize safe driving at a low cost.

Furthermore, linking with FUJITSU IoT Solution UBIQUITOUSWARE FEELytm²⁾, a wearable sleepiness detection sensor, has enabled the operations manager to acquire sleepiness information of drivers in real time (Figure 3).

4) Improvement of transport quality by utilizing sensor information

By registering the delivery routes in advance, it is possible to automatically estimate the arrival to the planned delivery destinations and subsequent departure based on the GPS information from smart devices. And this eliminates the need for such operations by drivers. In addition, the management screen of tablets, etc. can be used to grasp the information in real time. Furthermore, the Vehicle Information and Communication System (VICS) can calculate the arrival predictions (time and distance) to the next delivery destination and the progress can be displayed as a percentage.

Moreover, temperature loggers installed in the

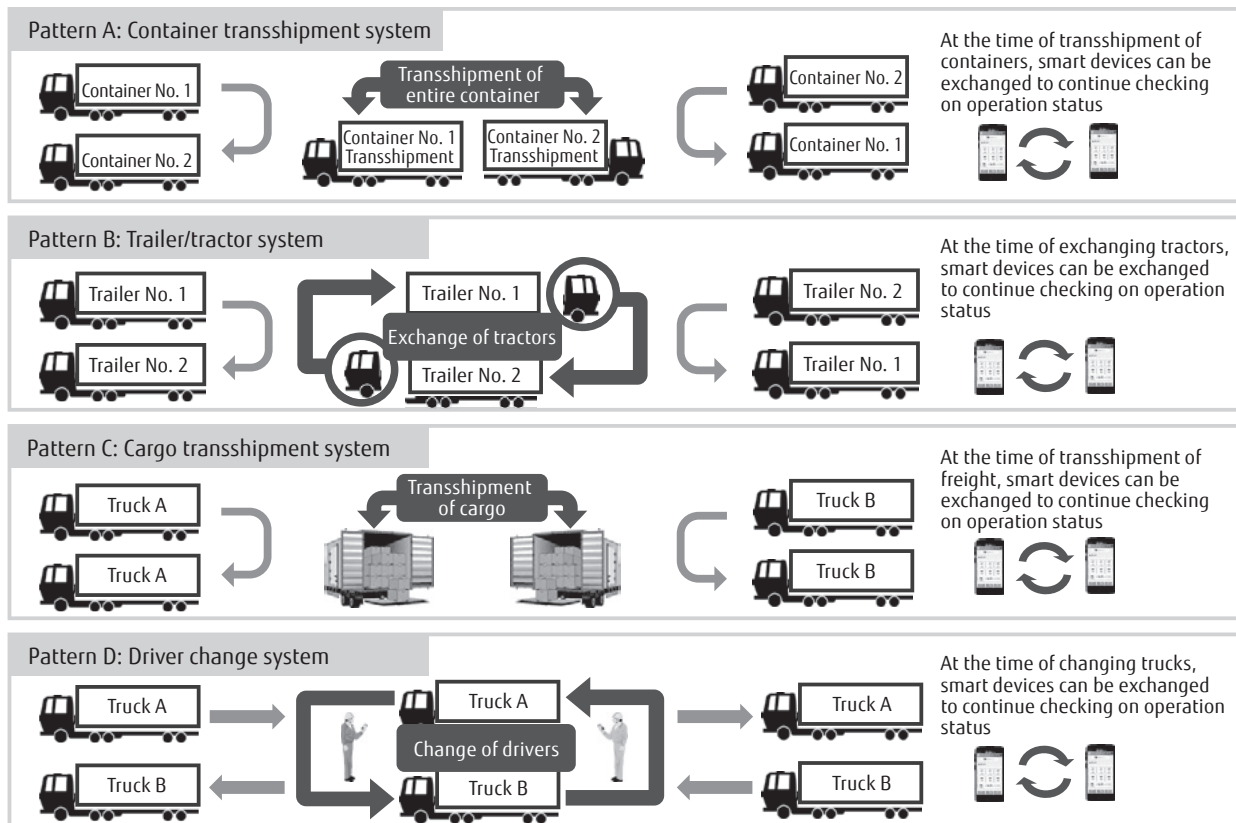


Figure 2
Patterns of relay transport.

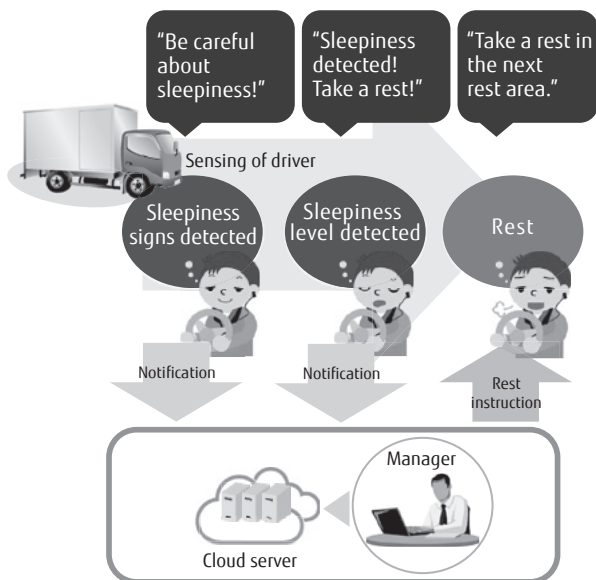


Figure 3
Conceptual image of linking with sleepiness detection sensor.

refrigerators of trucks can be linked so as to monitor the refrigerator and product temperatures during transport. The temperature loggers can be configured to communicate independently of smart devices and can give temperature warnings to the drivers and manager in real time, even when the drivers are away from the vehicles (Figure 4).

5. Benefits of Logifit TM-NexTR

The following describes the effects of introducing Logifit TM-NexTR into customers' operations.

1) Consignor companies

- Improvement of services for customers

The delivery results and arrival predictions can be visualized by disclosing data on the Web, and this has led to improved services for delivery destinations and other customers. In particular, simply having the drivers carry smart devices means that information about

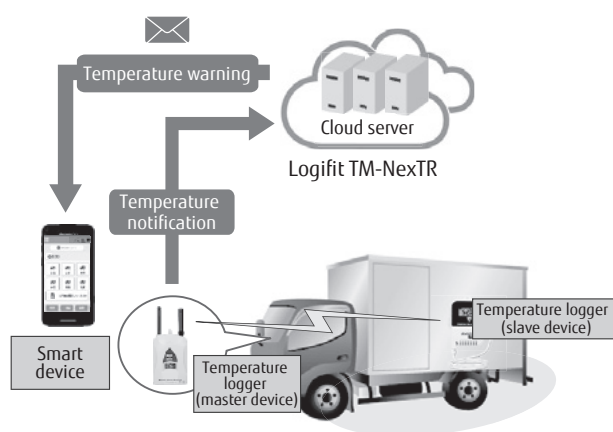


Figure 4
Conceptual image of linking with temperature logger.

vehicles on unexpected spot charter^{note)}, which was difficult to grasp in the past, can now be easily managed.

- Prevention of product accidents

Temperature sensors were used to detect product temperatures in real time and notifications were given to the manager and drivers at the same time. As a result, the number of product accidents due to abnormal temperatures was successfully reduced. As temperature sensors, the user can select from various models such as those accommodating a wide range of temperatures and those suited for the temperatures of the products themselves, which makes the system applicable to transporting medical supplies and blood as well as food.

- Reduction of driver's burdens

Use of smart devices has not only realized an inexpensive system but also minimized the operations that drivers need to perform, which has made it possible for logistics operators that have introduced a similar system on their own to additionally introduce this product, and thereby achieve management from the perspective of consignors.

2) Logistics operators

- Reduction of number of accidents and insurance premiums

Vehicle information acquired by an OBD-II connection can be used to achieve a violation warning function at the same level as dedicated devices such

note) Loaning of vehicles from other logistics operators when there is a lack of vehicles for reasons including busyness.

as digital tachographs, and this has raised drivers' awareness of the need for safe driving. As a result, the number of accidents has decreased, leading to reduced insurance premiums.

- Reduction in number of wrong deliveries

Recently, ad hoc services have been increasing because of a shortage of drivers and there are many cases where drivers have to take routes that are new to them to deliver in a hurry. The present system features delivery planning, which can be linked with navigation to prevent wrong deliveries. There were also cases in which handheld terminals were adopted as the management devices to be applied to inspection at the time of loading and delivery.

As described above, support for safe driving and improved transport quality have been realized more simply and inexpensively by linking smart devices with sensor devices. From the perspective of consignor companies, it has become easier for them to apply the management system to subcontracting companies that had difficulty in introducing the system in the past.

By minimizing operations on smart devices, the burdens on drivers were also minimized even when digital tachographs were already introduced, and this has led to customers giving the system a high rating.

In order to further expand the scope of targets of management, it is necessary to consider making it easier to acquire information by using drivers' individually owned devices and including the management of spot deliveries.

6. Potential of Logifit TM-NexTR

In the future, we intend to make contributions to safety and quality improvement as described below.

1) Further improvement of support for safe driving

We aim to have even more enhanced support for safe driving by making use of Fujitsu's big data analysis technology to characterize the degree of safe driving for each driver.

2) Further improvement of transport quality

Sensing technologies are expected to continue to evolve in the future and new sensor devices are likely to become widespread. We aim to further improve transport quality by taking advantage of these technologies and engaging in co-creating systems with customers.

3) Advanced demand prediction and optimization of logistics resources

In addition to the above, we as the Fujitsu Group intend to work on improving the efficiency of logistics as a whole. To deal with the shortage of human resources due to the declining birthrate and aging population in Japan, and more-frequent deliveries caused by smaller shipment lots, big data can be utilized in a consumer-driven manner to improve the efficiency of logistics overall.

For example, by linking the inventory changes and human resource operation results with external big data such as consumption behavior, information from social media and weather information for logistics prediction, problems including production delays, shortage of vehicles, and delayed deliveries can be prevented.

7. Conclusion

This paper has presented Logifit TM-NexTR, Fujitsu's new next-generation operations management solution.

We are considering providing the following support and expanding the system for the future.

1) Support for increase in number of devices to be linked with smart devices

As smart devices become widespread, wider varieties of peripheral devices and sensors that can be linked are becoming available. We intend to further advance operations management by using smart devices at the core and linking them with various sensors.

2) Overseas expansion

There is also a similar trend of diffusion of smart devices and their peripheral devices outside Japan, and we believe there is an environment that allows this product to be rolled out outside Japan as well. While there are issues related to regional characteristics (such as language, law, and culture), we plan to expand the application of Fujitsu's operations management service to outside Japan while resolving these issues.

Fujitsu is committed to continuously providing solutions that are valuable to customers by taking advantage of the IoT.

References

- 1) Fujitsu: Fujitsu Launches Enterprise Application Logifit TM-NexTR, Enabling Use of Smart Devices as Conditions Require.

<http://www.fujitsu.com/global/about/resources/news/press-releases/2015/0806-01.html>

- 2) Fujitsu: Fujitsu Launches FEELytm, a Wearable Sensor That Promotes Safer Driving.

<http://www.fujitsu.com/global/about/resources/news/press-releases/2015/0119-02.html>



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