# Usage of M2M Service Platform in ITS

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**Abstract**

This paper deals with the current trends and future direction of ITS (Intelligent Transport Systems), as well as the Probe Information System which serves as the backbone for various ITS services, and the usage of an M2M service platform that efficiently realizes systems based on the Probe Information System.

**Keywords**

ITS, M2M service platform, Probe Information System

## 1. Introduction

Various issues including energy, global warming, and an increasingly aging population, are poised to drastically change the environment surrounding our mobile society. This being the case, ITS is breaking away from the conventional closed vehicular system to becoming more and more integrated with the systems of society. This paper introduces the current trends of ITS, the direction of next-generation ITS, the Probe Information System as a specific example of such, as well as M2M service platform usage as a means to achieve it.

## 2. Current Trends of ITS

ITS has progressed under the joint efforts of public and private sector, with the objective of achieving a mobile society that is safer and more secure, eco-friendlier, more convenient, and efficient. This includes services promoted by the Japanese government such as ETC (Electronic Toll Collection) for automatic toll collection on expressways, VICS (Vehicle Information and Communication System) which provides traffic information to car navigation systems, as well as telematics in which automotive companies provide POI (Point Of Interest) information to users. Such services have gained acceptance from customers and are producing solid results.

On the other hand, the world surrounding the mobile society is in the process of drastic change. According to "Japan's Energy 2010" published by the Agency for Natural Resources and Energy, the reserves-to-production ratio for main sources of energy are 42 years for oil, 60 years for natural gas, 122 years for coal, and 100 years for uranium. The car is likely to move away from dependency on petroleum at an accelerated pace. And from the standpoint of global warming, we face a serious situation as $CO_2$ emissions by the year 2050 are expected to reach 2.5 times the levels for 1990, unless corrective measures can be taken.

What's more, although traffic accidents resulting in death are on the decline, accidents involving persons over 65 years of age are on the rise. Statistics for 2009 show that these elderly drivers accounted for 70% of traffic accidents involving pedestrians, and 40% of accidents resulting in death behind the wheel. It is said that if the pace of Japan's aging society continues at the current rate, over 30% of the entire population of Japan will be 65 or older by the year 2030. Furthermore, many lives were lost during the Tohoku Earthquake and Tsunami this year because appropriate instructions could not be given to drivers. How cars are to be directed in times of emergency is a major challenge that needs to be addressed. ITS should play a role in addressing these challenges of society.

## 3. Direction of Next–Generation ITS

It is expected that next-generation ITS will become increasingly unified with societal systems as a result of these changing social needs.

On the other hand, technology trends show that the development of IEEE802.11p, a technology used in road-vehicle and vehicle-vehicle communication, is underway. Applications utilizing this communication technology are being considered, such as improving safety by preventing collisions at intersections, and preventing wrong-way travel and pileups on expressways. Plus, on the environmental front, there is the so-called Green Wave, which uses IEEE802.11p to control vehicle speed so traffic signals are green when intersections are reached, facilitating the smooth flow of traffic. This communication technology is being studied worldwide, and it allows implementation within the same architecture for both vehicle-vehicle and road-vehicle communication. What's more, Internet connection is also possible via the road infrastructure.

NEC plays a major role in developing multi-hop communication technology for a project in Europe which is based on position information using IEEE802.11p. This type of technology can prove invaluable in times of natural disasters by conveying emergency information to cars, and in cases where mobile phone networks become inaccessible, also using the car which has its own power source as an emergency communication media by utilizing multi-hop communication.

What's more, the advent of LTE (Long Term Evolution) which establishes links within the ITS communication range with reduced latency, is extremely meaningful. The mobile phone network until now has been at a level that allows accident prevention before impact and emergency information after impact. But now we see the possibility of being able to continue using the mobile network even in areas very close to a critical impact.

Since the bandwidth for LTE is wider than 3G, more cars can be connected with a latency of 0.1 seconds or less, which is more than sufficient for supporting of safe driving. However, for the control domain immediately prior to impact, IEEE802.11p is required at this stage.

Smartphones have shown enormous growth in recent years, and the number of people using smartphones for car navigation is increasing. And we're seeing the appearance of systems that display the smartphone's navigation system screen on the display of the car entertainment system. However, it is also a fact that the number of viruses that target Android has grown from just 5 types in the entire year 2010, to 57 types in just the first five months of 2011. When adopting an open terminal for use in vehicles, it is crucial to take into account the security necessities of an in-vehicle system.

Another big trend is the evolution of cloud computing on a worldwide scale. In addition to facilitating system openness, such as by using an open terminal for an in-vehicle system, it also becomes easier integrate services since cloud computing enables standardization and sharing of services. Just as car manufacturers, etc. are already undertaking regional proving tests for the "smart community," a co-integration can be realized by linking cars with the surrounding infrastructure, home facilities, roadside information and other various services via networks. In the future, co-integration of various services that go beyond the scope of telematics and ITS should occur, including public services (disaster control, etc.), energy services (energy management, etc.), and distribution services (e-commerce, etc.) that link cars and people through cloud computing.

Through the spread of LTE and vehicle-vehicle communication, we expect the link between cars and networks will continue to become stronger. And through Cloud Computing, the co-integration of various service fields is expected to rise. As stated earlier, the ability to focus on the needs of society, and how the integration of related technologies is achieved, will be the key factors for the direction of next-generation ITS.

## 4. Probe Information System

Among ITS services, one category that is gaining interest is

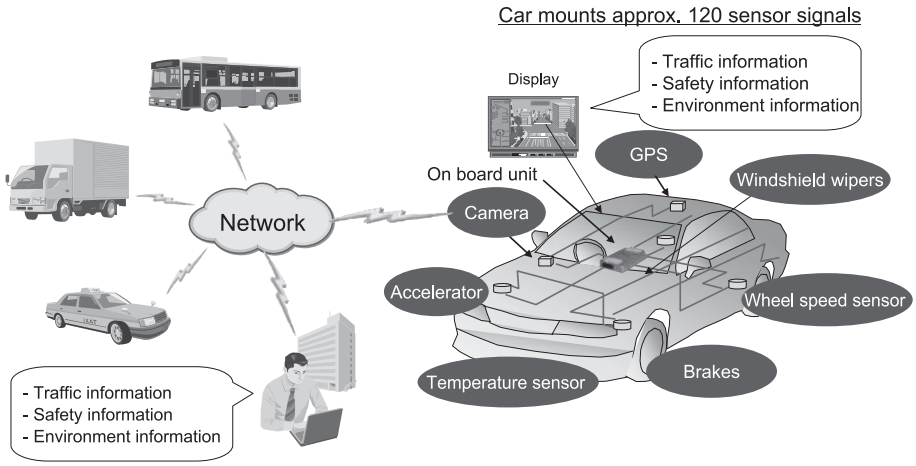


Fig. 1 Probe Information System.

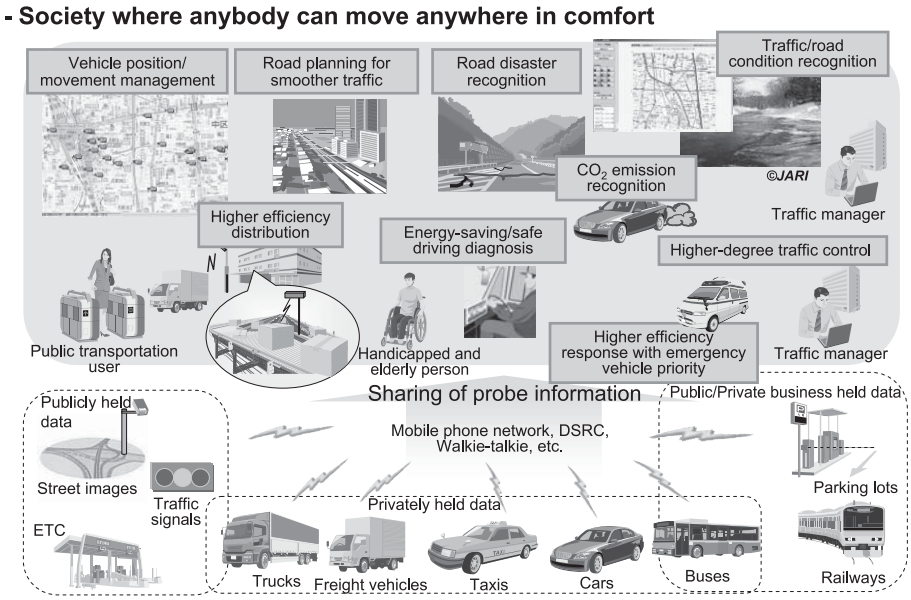


Fig. 2 Society making use of probe information.

services based on the Probe Information System. As shown in **Fig. 1** , the Probe Information System regards the car as a moving sensor, collecting various sensor data (i.e. probe information) from the car via network, then consolidating and processing them to provide information that contributes to reducing traffic congestion, improving safety, and protecting the environment. Implementation of this system has already begun as part of telematics service for car manufacturers and commercial vehicles. Service content includes route guidance taking congestion information into consideration, as well as notification of road freeze locations based on ABS (Antilock Brake System) information, and hazardous locations based on rapid acceleration/deceleration information.

Currently data is being collected by different companies, however the amount of available data will increase by sharing probe information. We are seeing a trend of sharing common information in order to provide better service. As a business model it still has issues that need ironing out, and remains at the testing level, however in the future we believe it can be utilized in a variety of ways as shown in **Fig. 2** . These include analyzing information from various vehicles including cars, buses, taxis and commercial vehicles, as well as data from a wide range of other sources including the national infrastructure, in order to reduce $CO_2$ emissions, increase traffic flow efficiency, provide emergency traffic maps, and act as a resource for road planning and civil engineering. We believe that a major trend for the future will be the processing of various information including that gathered not only from vehicles but also from other sources, in a way that matches the needs of society.

## 5. M2M Service Platform Usage

As we’ve shown in the Probe Information System example, a key issue is how to improve mobility in the future mobile society by gathering, analyzing and integrating various information provided through the network. In this way, it will become possible to greatly reduce the cost social infrastructures themselves, and new business opportunities will be generated. What’s more, lifestyles are sure to change.

How information is efficiently generated, processed, analyzed and distributed will be vital issues for building a new, mobile society. When considering the requirements of the system from such a perspective, we arrive at the following points.

(1) It must be easy to connect various devices to the network.
(2) It must be possible for gathered information to be distributed laterally among applications.
(3) Shared standards must be established in order to laterally distribute between applications.

The M2M service platform that NEC envisions will be able to build a system that efficiently generates, processes, analyzes and distributes information that meet our requirements. System characteristics, when utilized in a Probe Information System, will be as follows.

**(1) It must be easy to connect various devices to the network.**

It will be possible to gather information from various types of vehicles including cars, buses, taxis, and commercial vehicles, with ease, and without worrying about specifications, because a number of common standardized interfaces such as OMA-DM (Open Mobile Alliance-Device Management) are used, and also due to free distribution of software modules which act as general-purpose device agents, and having an interface architect that can flexibly accommodate different specifications.

**(2) It must be possible for gathered information to be distributed laterally among applications.**

It will be possible to realize horizontally-integrated multi-services through efficient multi-threaded processing and scalability provided by scale-out to accommodate the large volume of gathered information, as well as setting security levels to match the gathered information and utilizing hardware with access limitations. By these means, it will be possible to securely share various information acquired from vehicles including position, speed, acceleration, wipers, ABS, engine RPM, and so on.

**(3) Shared standards must be established in order to laterally distribute between applications.**

It will be possible to easily build various applications, such as traffic information, hazard warnings, vehicle movement management, and eco-drive, onto a single platform. This is because multiple interfaces are implemented to enable access from various applications to information accumulated on the platform, as well as receipt of control commands and event notifications from in-vehicle terminals.

**Fig. 3** is a conceptual diagram of NEC's M2M service platform.

As you can see, the M2M service platform proposed by NEC is well suited for utilizing the various information that flows into networks such as next-generation ITS, because the Probe Information System is equipped with all necessary functionality.

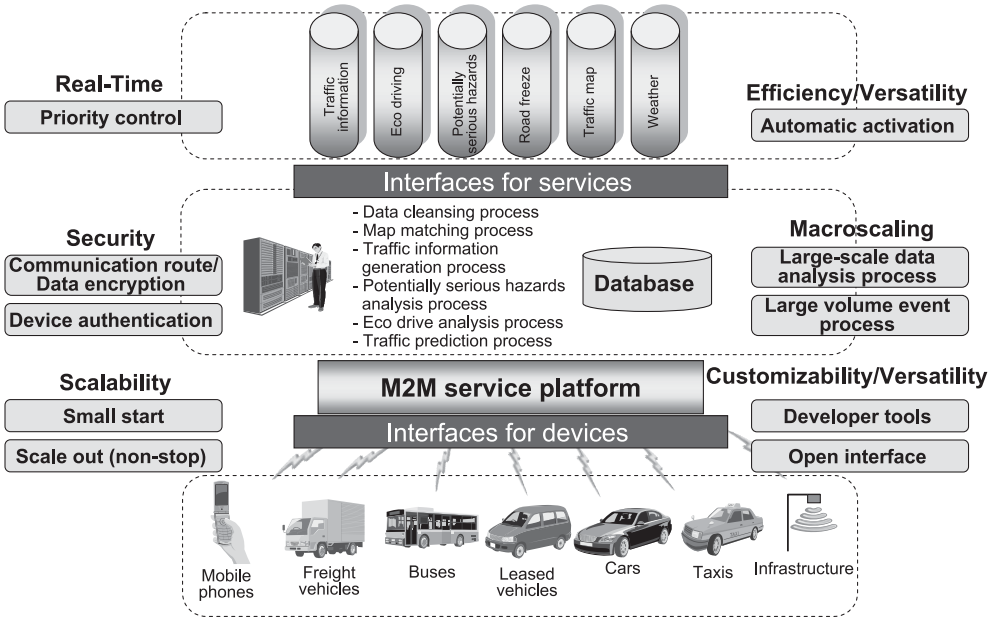


Fig. 3 M2M service platform usage in ITS.

## 6. Conclusion

This paper has described the current trends and future direction of ITS, the Probe Information System as an example of services, and the usage of the M2M service platform to create an efficient system based on the Probe Information System.

Next-generation will be required to accommodate changes in society while integrating with social systems in order to achieve the mobile society of the future. Against this backdrop, we will aim to create added value through systems that meet the future needs of society with ample scalability and flexibility, by utilizing M2M service platform to integrate ITS with society.

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*VICS is a registered trademark of Vehicle Information and Communication system Center.

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