ITS Trends and the Approach of NEC

ITS is entering the second stage of its development. With the aim of improving safety, security, environmental compliance and convenience, the public sector, the private sector and academia are combining their efforts to advance ITS in the next stage of its development. NEC Group is moving forward with the development of various solutions that will pave the way for the second stage of ITS, and the core technologies that will support these solutions. In this special issue, we will take a look at current trends in ITS and introduce how NEC is responding to the challenges.

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1 ITS Trends

1.1 Overall Trends

Over the past 10 years, ITS has made considerable progress with VICS and ETC moving into practical application thanks to the combined efforts of the public sector, private sector and academia. Currently the cumulative total number of vehicles with a car navigation system equipped with VICS functionality and/or an ETC device has reached almost 20 million, and ITS is ready to enter the second stage of its development, during which the following three objectives will be targeted:

1) Safer and more secure society (“Zero traffic fatality” Society);
2) Eco-friendly and efficient society (“Zero congestion” Society); and
3) High-convenience and high-comfort society (“Zero transportation stress” Society).

1.2 Trends in Safety and Security

A special emphasis has been placed in the field of safety and security. The Cabinet Secretariat announced the New IT Reform Strategy in January 2006, and resolved to make the world’s safest road transport society and achieve a reduction of annual traffic-related fatalities to under 5,000 by the year 2012 through promotion of ITS and other measures.

Up to now, conventional automobile safety measures have been focused on the concept of Passive Safety and the development of measures such as airbags and safety belts that are mainly designed to cope with post-collision consequences. However, in order to reduce further traffic accidents, it is necessary to tackle how to avoid collisions. This concept of Active Safety is the focus of increasing attention. In order to realize Active Safety, it is essential to have sensor technology that can grasp the behavior of the preceding vehicle and communications technology that can acquire information from vehicles in the vicinity and other information beyond the scope of sensor technology (road-vehicle communications between an on board unit and a roadside unit, as well as vehicle-vehicle communications), and

research and development in these technologies is vigorously pursued in Japan, USA and Europe.

In detail, this is accomplished by using sensors such as infrared cameras and visible light spectrum cameras installed along the roadside to detect potential dangers that are either difficult or impossible for the driver to see, and then communicating the information to the driver via road-vehicle communications, calling the driver's attention to potential hazards such as overlooking halt signs or traffic signals. In addition, vehicle-vehicle communications enhance safety by grasping mutual behavior of the vehicle.

Under the guidance and leadership of the Cabinet Secretariat, the New IT Reform Strategy promotes a concerted effort by ITS-related government ministries and institutions, ITS Japan, the automobile manufacturers, electronics device manufacturers, and universities to reach the goal of launching service by 2010.

In the USA and Europe, a similar approach is moving forward. The USA is currently advocating a project called VII (Vehicle Infrastructure Integration) that aims at achieving "Safety" and "Reducing Congestion" based on road-vehicle communications. The project is undertaken by AASHTO (American Association of Highway and Transportation Officials), Department of Transportation, and automobile manufacturers (GM, Ford, Daimler, BMW, Toyota, Honda, Nissan, VolksWagen).

Europe has a set a goal of cutting traffic fatalities in half by 2010. Development for their project called "e-Safety" is being undertaken by the European nations (See **Fig. 1**).

1.3 Trends in the Environmental Field

The Kyoto Protocol calls for Japan to reduce its greenhouse gas emissions by at least 6% compared with 1990 levels during the period from 2008 to 2012. Among the various targets, the transportation industry is charged with achieving a target of 250 million tons of CO_2 emissions by fiscal year 2010, and in order to achieve this goal, the industry must cut 54.9 million tons from the current total. The breakdown for achievement of this goal is a reduction contribution of 21 million tons through improved fuel consumption, 13.8 million tons by traffic flow measures, and 5.6 million tons through improvements related to the vehicle itself and other measures. Among these, there are high expectations for ITS as a solution to traffic flow-related problems to contribute to the achievement of the targets.

Within the development of ITS solutions for traffic flow, the Probe Information System is attracting a great deal of attention. In the Probe Information System, the vehicle is considered as a "moving sensor." By transmitting various vehicle data such as location and speed from each vehicle, it is possible to obtain traffic conditions of the road, on which the vehicles are traveling. With this system, it is possible to have a clear and real-time grasp of traffic conditions on more roads than would be possible with a system of sensors installed on expressways and other major traffic arteries. With this ability to grasp the traffic

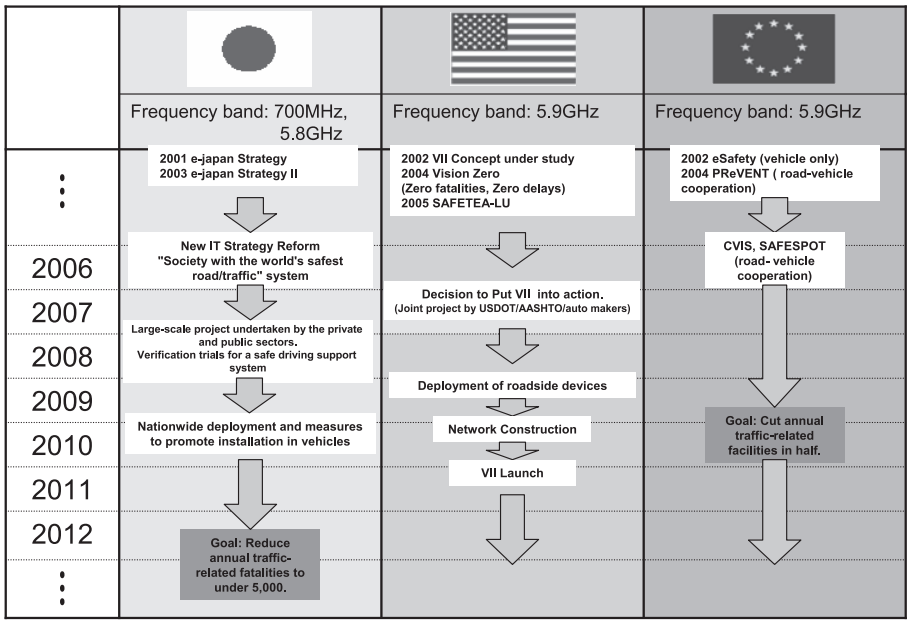


Fig. 1 Approaches to tackling traffic safety in Japan, USA and Europe.

conditions on non-major roads for which data could not be acquired with approach of roadside sensors, it becomes possible to provide drivers with optimum route guidance information, and avoid emission-generating congested conditions (See **Fig. 2**).

1.4 Trends in the Field of Enhanced Convenience

In the private sector, Telematics services that link vehicles with networks are being launched by automobile manufacturers as well as truck manufacturers and car lease companies. Already over one million vehicles are receiving various Telematics services such as traffic information using probe information, Points Of Interest information in the vicinity of the current vehicle location, and "environmentally-friendly" or "safety" driving diagnosis. Also solutions utilizing the widely spread car navigation systems and onboard ETC devices are beginning to appear. By using the static ID of the onboard ETC device to uniquely identify and manage the vehicle, a variety of services such as in-out management of parking lots, cashless settlement by linking the ETC ID with a credit card number, and drive-thru type boarding systems for ferries, etc.

2 NEC's ITS Solutions

2.1 Solutions for Safety and Security

NEC is meeting the challenge of system development that integrates sensor, communications and other technologies essential for safety and security ITS solutions.

Smartway, which is promoted by the Ministry of Land, Infrastructure and Transport (MLIT), is the next-generation roadway that will realize by a diversity of ITS services. As one facet of the Smartway, NEC is undertaking a social experiment consisting of a service that provides information about obstacles on the Sangubashi curve in the Tokyo bound lane of Tokyo Metro

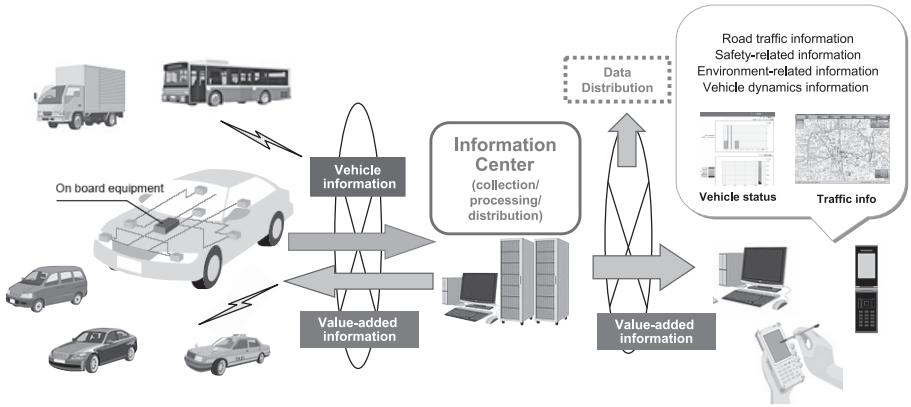
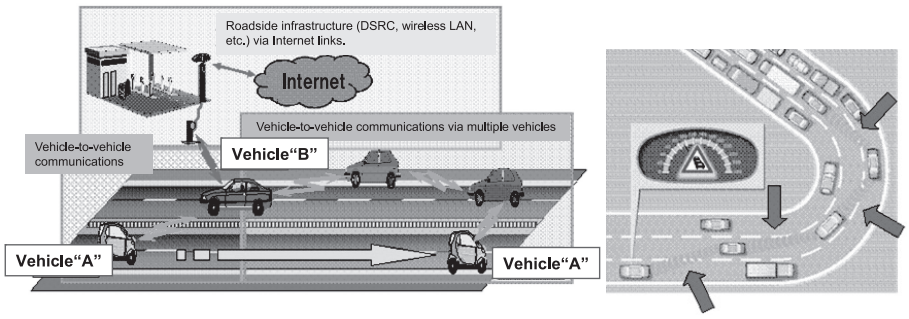


Fig. 2 Probe information system.



FleetNet relies on utilization of vehicle location information and a network that provides road-vehicle-vehicle communications through optimized routing of telecommunications.

Example of prevention of rear-end collisions with the tail-end of congestion.

Source: FleetNet project http://www.fleetnet.de

Fig. 3 FleetNet.

Expressway No. 4 Shinjuku Route. The service uses roadside infrared sensors to detect the presence of stopped vehicles and other obstacles, and then transmits the information to the passing vehicles via a roadside antenna. A warning or operational guidance is delivered to the driver via car navigation system or other device installed in vehicles, which enhances driving safety.

The Driving Safety Support Systems (DSSS) solution promoted by the National Police Agency provides drivers with surrounding traffic safety information either graphically on an onboard 3-media-compatible VICS device display or audio voice guidance. This system aims at traffic accident prevention by bringing hazardous factors to the driver's attention and raising awareness of safe driving practices. NEC is participated in testing of an information provision system to prevent rear-end collisions in Toyota City, Aichi Prefecture, and also in trials for a system to prevent rear-end collisions with vehicles waiting for a traffic signal on a crest-type bridge in Hiroshima City, Hiroshima Prefecture.

In addition, NEC is also active in Europe where it is a participant in the German government's project FleetNet and NOW (Network on Wheels), and is producing results in its roles as developer of the core for the road-vehicle-vehicle communications protocol. Also in Europe, NEC is providing this communications protocol for the Car-to-Car Communication Consortium (C2C-CC), which was established by major automobile manufacturers, and is contributing to the formulation of specifications that may eventually serve as a standard (See **Fig. 3**).

2.2 Solutions for Environment

In the field of ITS solutions that contribute to environmental improvement, NEC is tackling the development of the Probe Information System, which is expected to realize maximum benefit from improved traffic flows.

With support from the strategic program to support the research and development of information and telecommunications technology under the auspices of the Ministry of Internal Affairs and Communications, NEC has been working together with Nagoya University, Denso Corporation, Toyota Mapmaster Incorporated, Japan Weather Association (JWA), A-works Co., Ltd., Liberra Corporation, and others, and has formed the Probe-vehicle based Dynamic Route Guidance System (P-DRGS) Consortium, and is moving forward with research and development of a dynamic route guidance system that uses probe information in the Nagoya area (See **Fig. 4**).

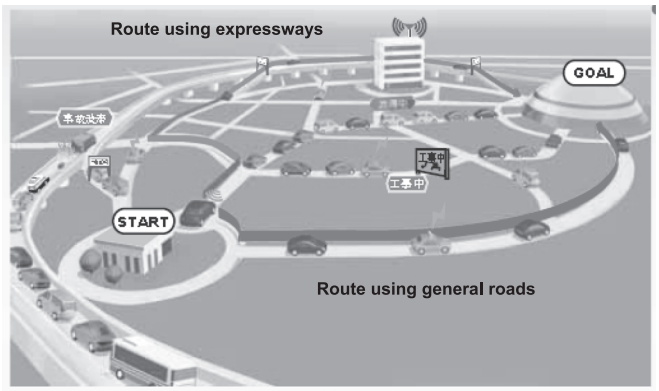
Also in 2006, NEC was responsible for building the automatic update function for Beijing's probe system travel time database. The system requires that all Beijing city taxis install devices that transmit location information, and then uses these position information data received from the taxis to generate road traffic information. This system will serve as the platform for China's future Telematics services.

In addition, an "eco driving diagnostics system" has been developed. It collects driving data in real time by IT, analyzes driving behavior, and then provides information about how to improve eco driving performance either by email or the Internet. This system is being used by auto lease companies and others.

2.3 Solutions for Convenience

With the aim of enhancing convenience, NEC has been developing solutions that use the ETC device and also working on solutions for pedestrians.

Photo shows the social trials of a parking lot that uses the



- **Forecasting the time to destination based on both historic and real-time probe data, the system provides the driver with the optimum route to avoid congestion.**

Fig. 4 P-DRGS for advanced route guidance.

Photo Parking lot using ETC that facilitates general parking and goods delivery spaces.

ETC device to facilitate combined use for general parking and goods deliveries in Toyota City, Aichi Prefecture. In a time-rental parking area, special space is set aside for vehicles engaged in the delivery/pickup of goods. When such a vehicle equipped with a specially registered ETC device approaches the parking lot entrance, both the parking lot entrance gate and the special barrier flapper for the parking space open, streamlining the delivery/pickup operations in the dedicated parking space.

NEC is also developing a device called Infosign that enables the provision of route guidance services for pedestrians and various other types of information through connections with mobile terminals using Bluetooth wireless communications technology. As an actual case study of a system that uses Infosign, there is the "World Heritage Site - Kumano-Kodo Navigation Project" that aims at providing multilingual (Japanese, English, Korean, and Chinese) delivery of route guidance and information about historical ruins, tourism facilities and shopping for the "Kumano Nachi Shrine Area" (World Heritage Site) in Nachi-Katsuura Town, Higashimura-gun, Wakayama Prefecture. Also in verification trials in the Sannomiya shopping mall of Kobe City, a system enables display of route guidance information on a mobile terminal that is retrieved from a server based on location information from Infosigns. Implementation of these systems are gradually spreading.

3 Conclusion

As described above, NEC is endeavoring to develop and provide solutions in the fields of Safety/Security, Environment, and Convenience for the second stage of ITS development. The following articles in this special ITS issue will introduce the solutions and core technologies in each area in greater detail.

NEC Group looks forward to taking full advantage its broad range of strengths and resources to provide you with more useful ITS solutions.

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