Application for EASTS Outstanding Transportation Project Award

(1) Name of the Project

Provision of passable road map using probe data for rescue and recovery operation

(2) Outline of the Project

For effective rescue and recovery operation in the Great East Japan Earthquake in March 2011, ITS Japan aggregated the probe data from telematics service providers and released as passable road map. (Figure 1)

The massive earthquakes and tsunami devastated coastal region of Japan. Road traffic information from roadside equipment in the region was totally lost. (Figure 2)

Government kept updating road closure information obtained by manual inspection for highways and major roads. ITS Japan released probe car data collected by Honda, Nissan, Toyota, and Pioneer, showing routes actually used on the previous day in blue lines on the map. With large amount of combined data, we could show in detail including small local roads.

However, some of those routes could be dangerous to pass or dedicated to rescue and relief operation. So, road closure information compiled by a government agency was super imposed on the map in red.

Survivors visiting their homes, drivers carrying relief goods could find the route they could actually use, which only integrated data by both private and public sectors can cover.

- Category of the Project: Construction or Planning

  Planning

  (Traffic information provision for emergency operation planning and management)

- Brief History

  The way we collect traffic information is changing. Conventional traffic information system is using fixed roadside sensors and message signs. Now, making use of already popular car navigation systems or mobile phones, traffic data can be collected based on the GPS data from the cars on road, which are called as ‘probe data’, and consolidated traffic information will be sent back to them in return. (Figure 3)

  Although roadside sensors can count the absolute traffic volume, coverage of roadside sensors is limited to the installed locations. On the other hand, we can get precise route of each vehicle from probe data but only from vehicles equipped with on-board equipment. In this way, characteristics and coverage of conventional roadside sensors

and probe cars are different. They will complement each other. In 2008, we started discussion on establishing common traffic information platform on which traffic data from both roadside sensors and probe cars are shared. (Figure 4) In 2010, we aggregated probe data from private businesses for three months and evaluated potential applications. (Figure 5)

As an application of probe data, research to create a passable road map started as early as 2004 initiated by the National Research Institute for Earth Science and Disaster Prevention of Japan working with Honda.

Then, we had the Great East Japan Earthquake on March 11, 2011. Based on the experience to aggregate probe data in the previous year, ITS Japan released passable road map collaborating with telematics service providers and public authority..

- Project Cost by Item (US$)

No additional cost was incurred because all the probe data were voluntarily provided by the telematics information service providers and existing web server was used at ITS Japan. Software necessary to aggregate the data was developed by voluntary work of engineers involved.

(3) Impact of the Project

- Social Impact

It was the first time people realized the huge potential of the large volume of data on movement of people and goods, and it was the first application which large population actually used. First, attention by mass media, general public and experts was focused on applications of those data to emergency operations under catastrophic natural disaster.

However, people gradually started to recognize true value of the system: public investment on infrastructure to collect data alone no longer meets the diverse needs for information. Rather information from individuals has much larger potential without investment if we can properly motivate people to cooperate and we develop a framework to handle such a large volume of data.

A number of projects exploiting large volume of data on movement from individuals through car navigation systems, mobile phones, and IC card tickets have been initiated. Finally, high level policy of Japanese government adopted the concept in ‘Basic Policy and Action Plan for Building IT Disaster-Management Lifeline’ in June 2012, and in ‘Open Government Data Strategy’ in July 2012.

One after another, innovative services will be introduced by new breed of people and totally new business sector will be created.

- Transportation Impact

Applications of probe data have been expected to give us solutions for safer, more efficient, and more resilient road transportation. (Figure 6) However, real deployment was not materialized due to a variety of institutional challenges, except for private sector commercial services.

Provision of passable road map using probe data for rescue and recovery operation was made possible by the highly motivated engineers, overcoming a number of barriers. This achievement has totally changed the atmosphere toward early deployment of anticipated applications.

New ideas are also emerging. We are facing difficulty in financing monitoring and maintaining road infrastructure, decades after rapid expansion of thousands of kilometers of highway network. We are urged to develop a system for early warning and mitigate impact of troubles. Use of sensing data from on-board equipment of cars connected to mobile communication network, which is already common today, is started to be investigated.

A door has been opened to new era of information technologies for transportation.

(4) Method/Technology of Project (Construction or Planning)

This system is designed running on internet, making use of existing platform. (Figure 7)

Probe data from subscribers of the telematics services were aggregated into a set of XML data by each service provider, showing routes on which at least one car traveled on the previous day. The aggregated data were put on their internet site.

Road closure information by manual inspection was collected by national and local government, and road operators. Format of the report varied depending on the organization. In many cases, information was analogue, printed or manually written under emergency situation. The information was sent to the Geospatial Information Authority of Japan. The information was then compiled into a set of XML data and put on its internet site.

ITS Japan downloaded the data from all the participating organizations' site and mashed-up those data with public domain digital map interface and put the data on the ITS Japan's website as a set of XML script.

Anyone who needed the passable road map could get it by just visiting ITS Japan's website. The first part of the XML script instructed the web browser to access a public domain digital map service with geographic coordinates. The rest of the script was a set of drawing data over the digital map showing passable routes in blue and road closures in

red.

The data could also be used for further integrated applications by the third party because it was in a widely used format in web applications.

By now, the system has been upgraded and ready to be put into operation within an hour. The minimum interval of data update is one hour, much shorter than 24 hours in 2011.

(5) Financing and Management

Permanent implementation of this service will be a part of integrated traffic information system or disaster management system; dedicated large scale investment won't be necessary.

(6) Uniqueness of the Project

1. Application of open information and communication platform concept:
   Framework of information services in private sector, such as smart phones and cloud services, is rapidly changing dominated by open platform concept. However, public services are still base on centralized dedicated system design. This project has shown effectiveness of open platform design in rapid, flexible and low cost deployment to satisfy public interest.

2. Collaboration among diverse organizations in public and private sectors:
   There had been a variety of institutional challenges still unsolved to implement probe based services, such as ownership of data, evaluation of quality of data, and cost sharing of probe data collection. Because of them, even field evaluation to determine the benefits and evaluate feasibility of technologies had been difficult. Overcoming the barriers, this project initiated long lasting collaboration among organizations.

3. Acceptance by both authorities and general public, paving the way to innovative framework of the future:
   It generally takes time for a new technology or new framework to penetrate in the society. This project played an important role for the general public and decision makers, who don't have expertise, to be exposed to the new technologies and their extraordinary benefit for the society. The society is transformed into supporter of new technologies.

(7) Pictures and Drawings on the project (either in Hard paper or in Electronic format)

A PowerPoint data file containing pictures and drawings with numbers corresponding to the reference in the text is attached.

(8) Point of Contact Person: Telephone, Facsimile, e-mail

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Attachment

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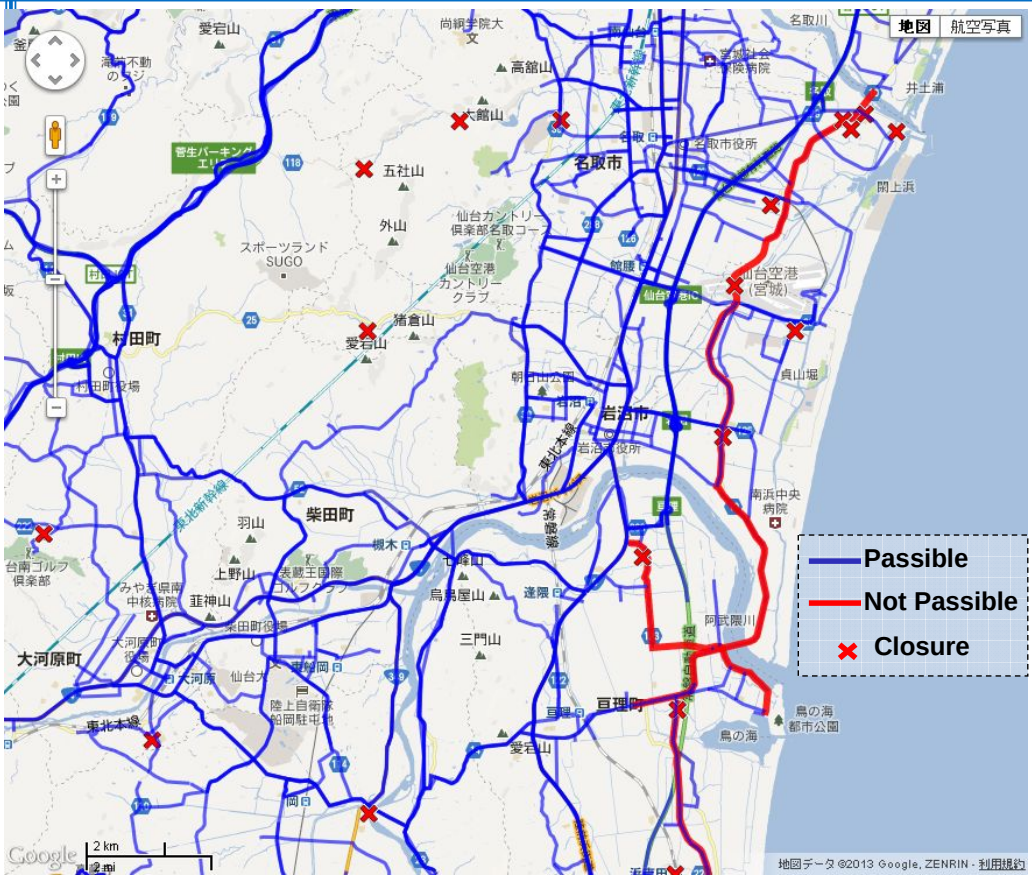
"Provision of passable road map
using probe data for rescue and recovery operation"

ITS Japan

Probe data with road closure information



Data sources

(Probe data)
- Honda
- Pioneer
- Toyota
- Nissan

(Road closure)
- Geospatial Information Authority of Japan

Figure 1

Lessons learned from the disaster

Source: Haruo HAYASHI, SS65, ITS World Congress 2011, Orlando

Figure 2

Intelligent Traffic Management System

Conventional Traffic Information System

Fixed sensor data

Central Tokyo

Traffic Control Center

Mobile Device based System

Probe Data

Central Tokyo

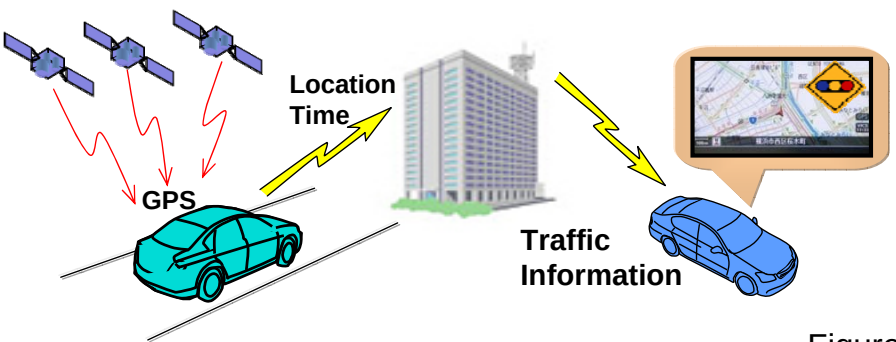


Figure 3

Traffic Information Platform

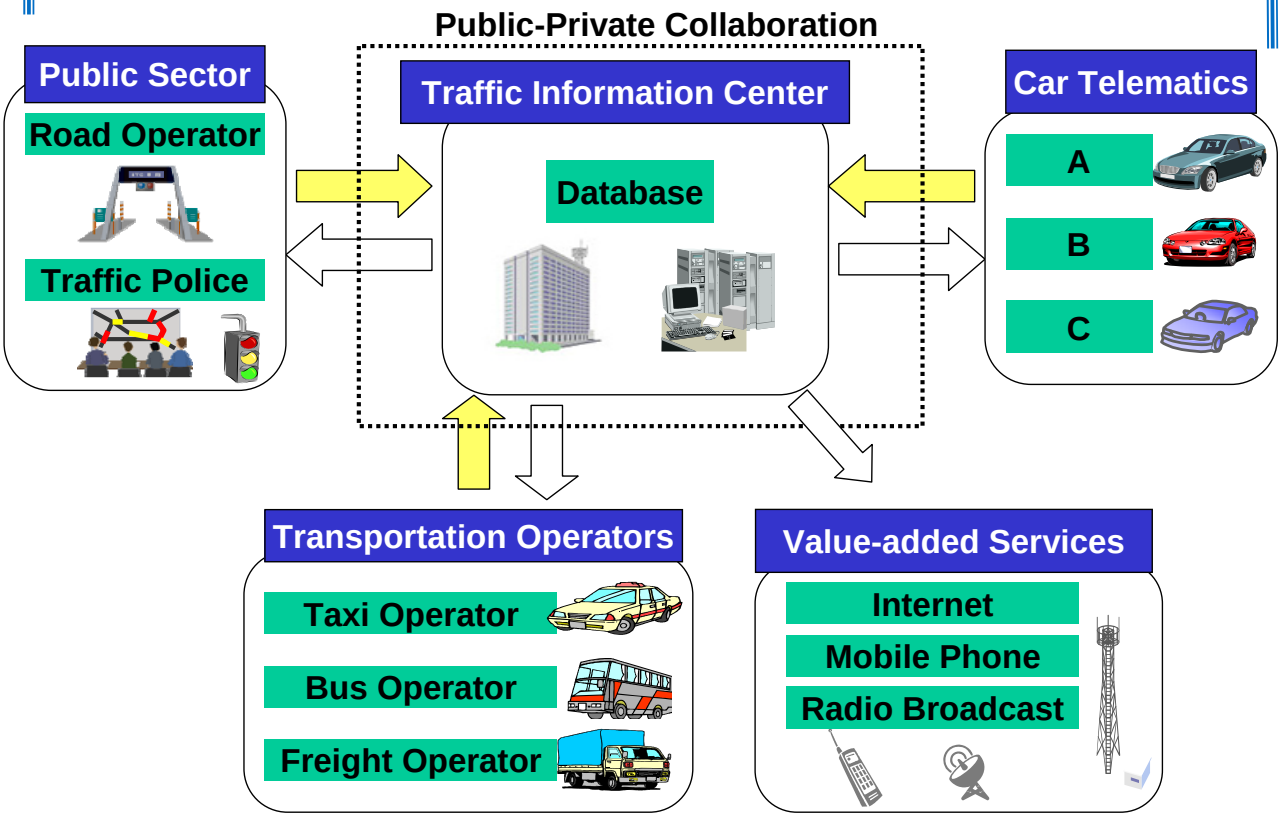


Figure 4

Probe Data Collected by Private Sector

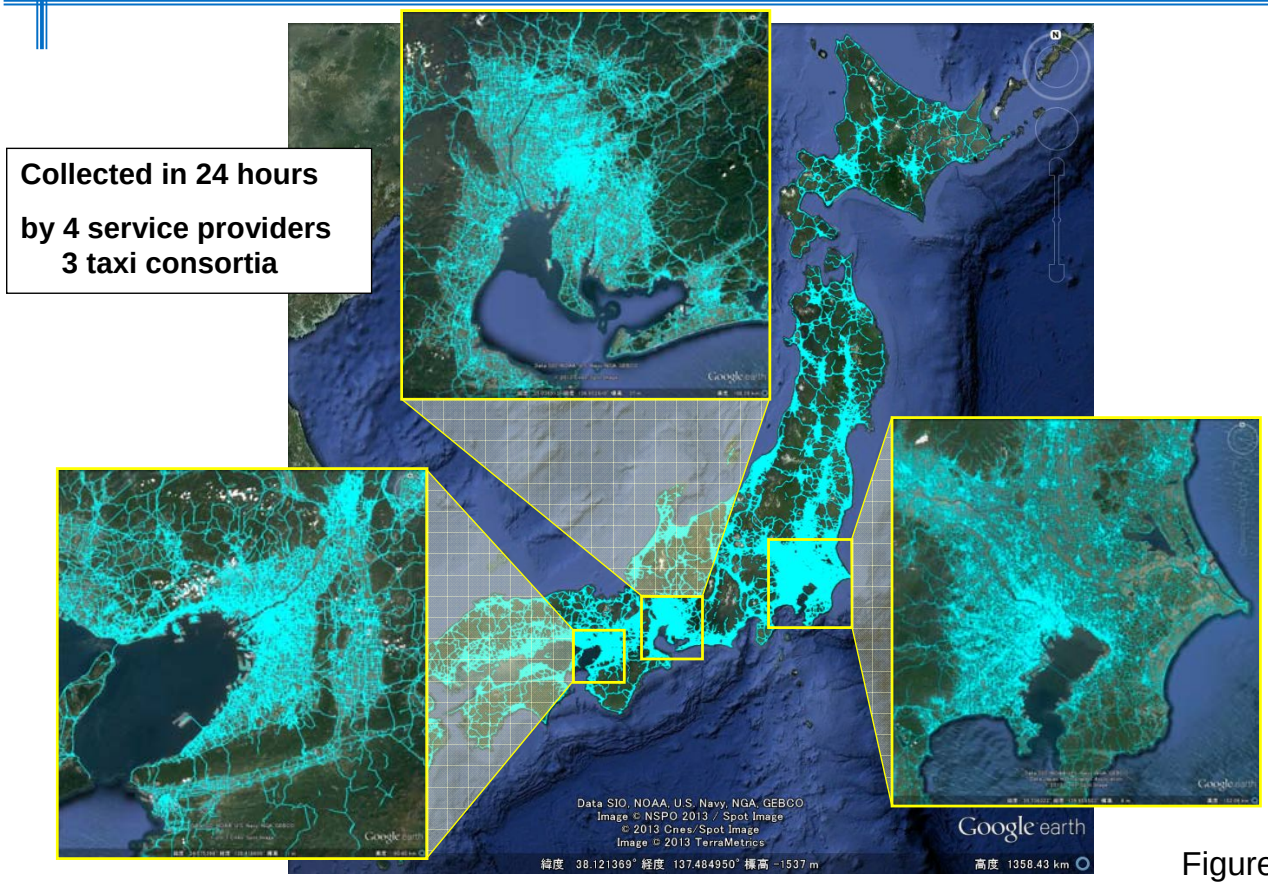


Figure 5

Resilient society with shared platform

Connected vehicles and people integrated in:

- shared information platform
- business models to foster innovations
- attractive and dependable daily services

will provide us with basis to build resilient society.

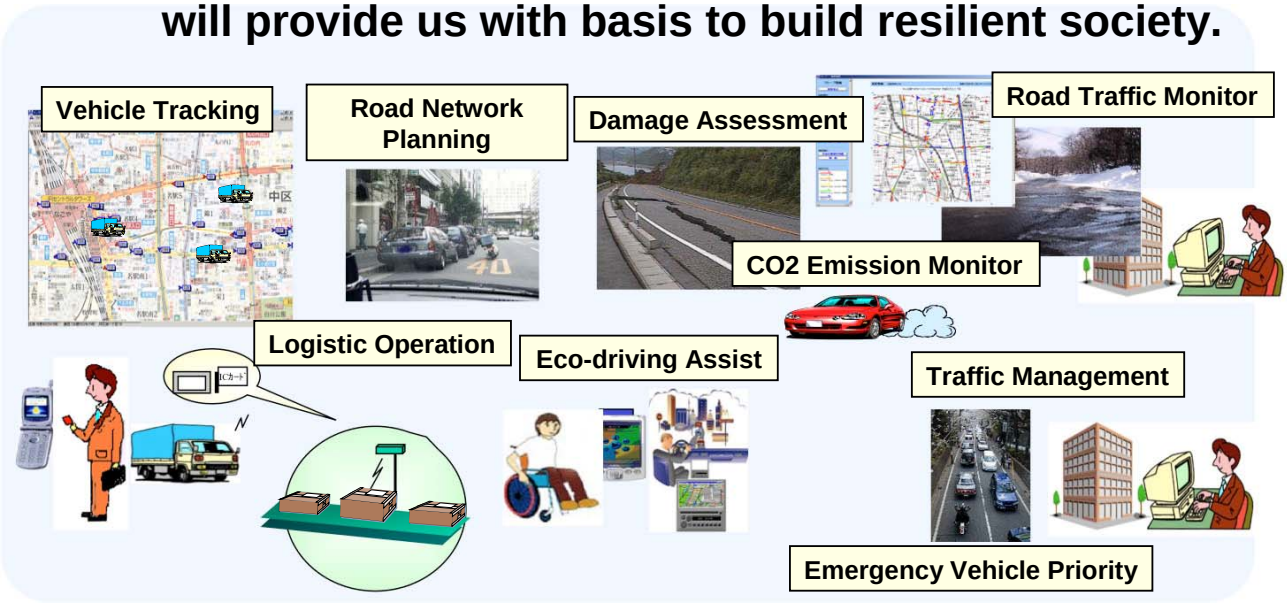


Figure 6

System structure

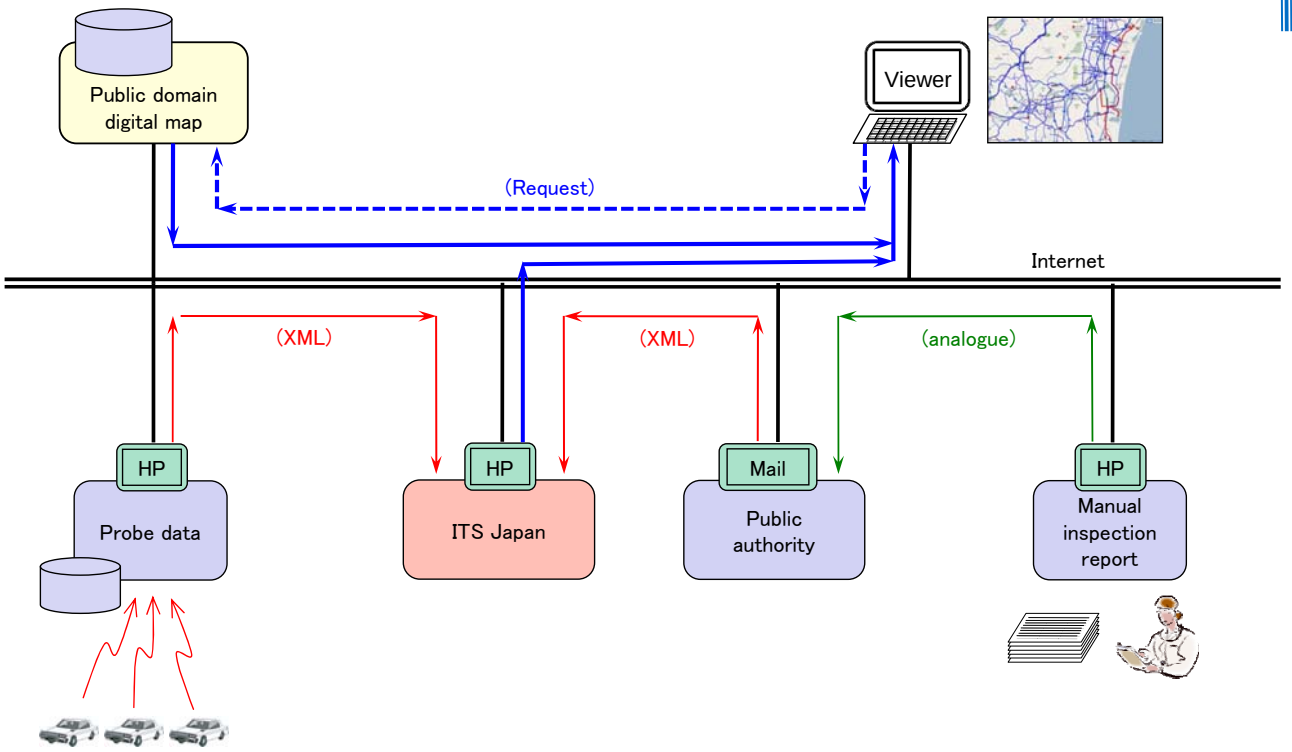


Figure 7