# Telematics Services and Their Prospects for the Future

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*OVERVIEW: The market for telematics services, which has been a promising market for the ITS (intelligent transport systems) industry, has begun a full-scale expansion. In addition to the increased popularity of cell phones and navigation terminals, which are the windows for telematics services, automobile manufacturers have begun to grapple with telematics in a serious way as a means of maintaining a continuous point of contact with the user. Hitachi, Ltd., as a general manufacturer of information systems that integrate car navigation, automobile equipment, telecommunication and computers, is promoting the offering of a telematics solution. The first phase has been the world's first commercial introduction of the driving route assistance service as an application for Nissan Motor Co., Ltd.'s integrated telematics service introduced in 2002. That service distributes digital maps and information on routes and facilities up to the destination point, mainly through Xanavi Informatics Corporation. The service came installed in several series of new automobiles announced by Nissan in 2002.*

## INTRODUCTION

THE "new telematics services" that started in 2002 by Toyota Motor Corporation, Nissan Motor Co., Ltd., and Honda Motor Co., Ltd. are a sign that the market is in a full-scale expansion in Japan[1)]. Along with the beginning of new services, strategic alliances among various industries are proceeding, and full-scale integration is occurring of various types of information services, typified by the Internet, into automobiles by way of customized mobile communications services. In Japan, Nissan began its integrated telematics service in February 2002, and Toyota followed by beginning its service in October of the same year. In the future, advanced navigation, music and video distribution, safety support, theft prevention and other such fields are also expected to expand greatly as second-generation telematics services.

Hitachi has established the Telematics Business Development Center as an organization for aggregating the telematics business of Hitachi Group, mainly through its wholly owned subsidiary, Xanavi Informatics Corporation, based on advanced map routing for car navigation.

Here, we explain how Hitachi has approached telematics services and describe the world's first commercially available map and route distribution service for an in-vehicle information terminal.

## HITACHI'S APPROACH TO TELEMATICS SERVICES

### Service Concept

The in-vehicle terminal is seen as a device that has developed from simple navigation-centered functions into a telecommunication-type in-vehicle terminal CIS (car information system). The CIS cooperates via an in-vehicle network (CAN: controller area network) with the vehicle control system, which controls the engine and transmission. Also, we are entering an age in which the vehicle is connected to a telematics center by means of digital broadcasting or cell phones, etc. and various kinds of equipment on the vehicle are connected with each other over a network (see Fig. 1).

Assuming the kind of platform described above, Hitachi is proceeding with commercialization of telematics services guided by the following policy:

(1) Developing attractive services that emphasize safety and security (navigation, traffic information, emergency assistance, etc.)

(2) Development towards telematics services, with the navigation system of Xanavi serving as a core product

(3) Developing a voice-centered HMI (human-machine interface)

(4) Developing new vehicle services that make use of various kinds of vehicle control information

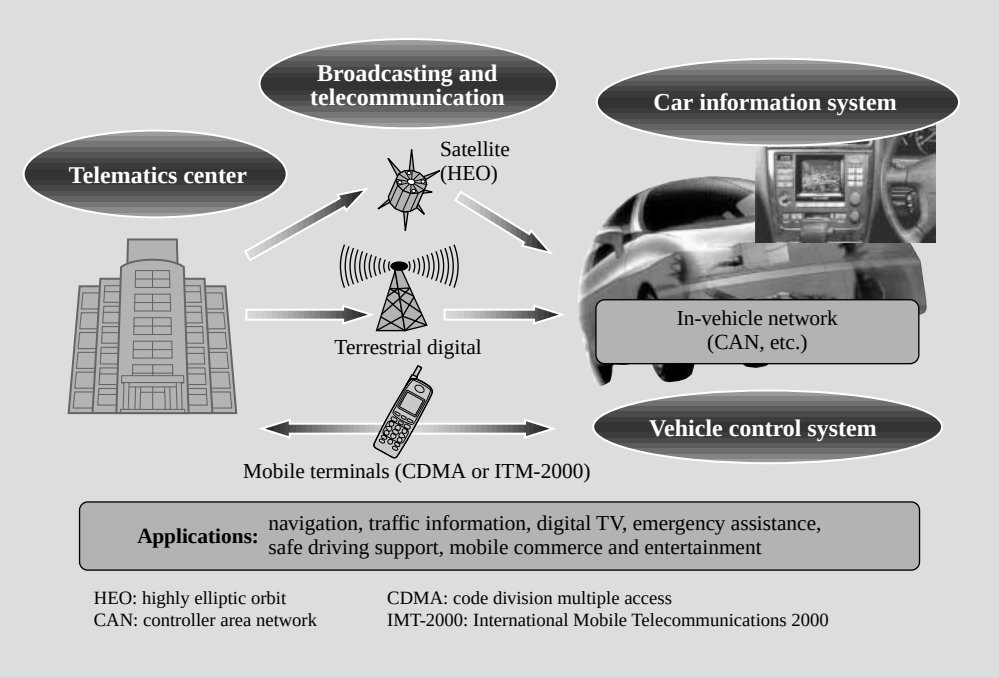


*Fig. 1—Telematics Service Concept. In telematics services, information is exchanged between a vehicle and the outside world via a cell phone or digital broadcasting to provide the driver with services for entertainment and safety.*

## Concept of In-vehicle Information Terminal

The in-vehicle information terminal that serves as the core of the telematics services is expected to evolve in two opposite directions: toward a low-cost off-board type terminal with the important functions residing at the information center and toward an advanced-function high-end terminal with built-in large-capacity hard disk drive and powerful multimedia functions. In particular, the off-board type terminal has the feature of always having access to the newest center system and of a low terminal cost, so it is expected to be widely popular. The concept of the IT terminal that Hitachi is aiming for is shown in Fig. 2. The IT terminal has the following features:

(1) Telecommunication function: This includes a function for communicating with the information center through cell phone calls or digital broadcasting, and a function for the exchange of information with a PDA (personal digital assistant) or cell phone brought into the vehicle (Bluetooth, etc.)

(2) Advanced HMI function: This is an HMI that allows operation by means of a screen display and voice recognition/synthesis.

(3) Vehicle information communication function: This function allows the input and output of information inside the vehicle by CAN.

(4) Data storage function: This function allows the storage and retrieval of map and multimedia information using a hard disk or plug-in memory device.

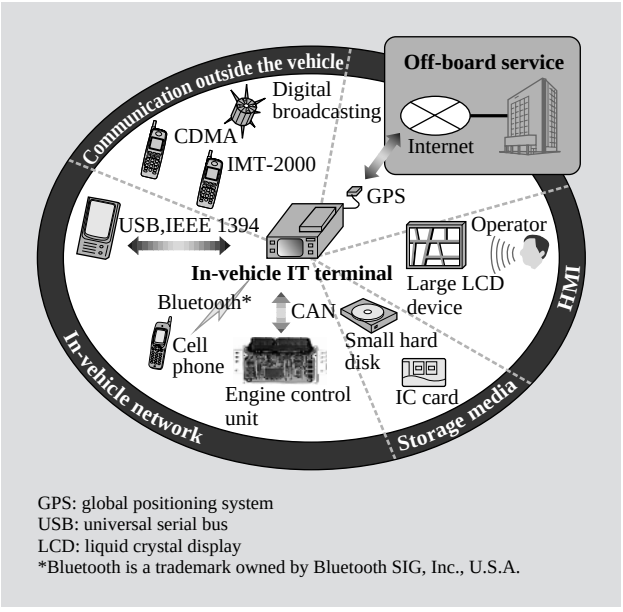


*Fig. 2—Hitachi's Target Concept for the In-vehicle IT Terminal. The in-vehicle IT terminal is a low-cost off-board type terminal for accessing services via a connection with a telematics center.*

Hitachi is proceeding with the development of commercial IT terminal and telematics system products through the coordination of the navigation development department, in which Xanavi takes the leading part, and the informatics systems department, which has IT expertise.

## HITACHI'S DRIVING ROUTE ASSISTANCE SYSTEM

### Overview

Hitachi's driving route assistance system is the world's first telecommunication type navigation service for distributing to in-vehicle terminals car navigation information such as the latest map information and the best route to the destination. A connection to the driving route assistance service information center is made from a cell phone that is connected to the in-vehicle terminal for the purpose of exchanging car navigation information. That makes it possible to always have the latest maps and the most suitable route guidance information. Furthermore, a large-capacity disk drive, such as the CD-ROMs or DVD-ROMs that are indispensable for conventional navigation equipment, is not needed, allowing the implementation of a low-cost in-vehicle terminal for the navigation service.

### Features

Hitachi's driving route assistance system is conceptually different from conventional car navigation systems. It provides navigation functions by data communication via a cell phone, separating the HMI and position finding functions that are indispensable for the in-vehicle terminal from the route search and map database functions, which require high-speed computation (see Fig. 3).

In the development of the driving route assistance system, it was necessary to constrain the amount of map and route guidance data that was communicated to an amount that did not reduce the users sense of freedom at the communication speed of the currently most popular PDC (personal digital cellular) system (9,600 bit/s). For that reason, a compact telecommunication format is used to reduce the data volume, and downloaded information is stored on a plug-in memory device card to reduce the number of communications.

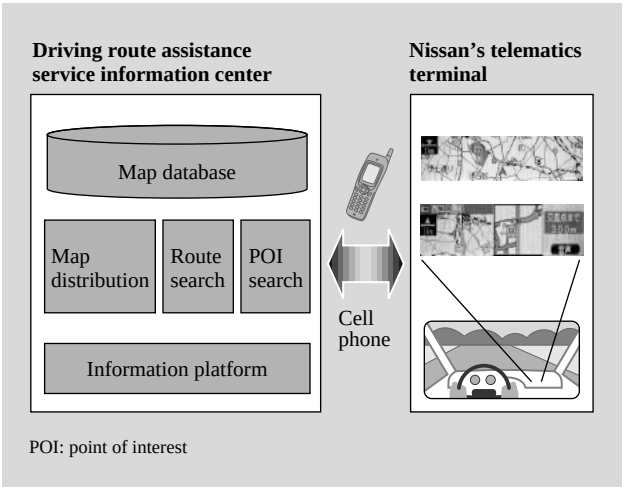


*Fig. 3—Basic Configuration of Driving Route Assistance System.*
*The navigation information computed at the driving route assistance service information center is distributed to the in-vehicle IT terminal via a cell phone.*

### Services Provided by Hitachi's Driving Route Assistance System

(1) Display map distribution service

The display map distribution service distributes map data for display on the display screens of the in-vehicle terminals or other such devices. This service is used when operations such as changes in display scale and scrolling on the in-vehicle terminal screen are performed and the map data is not present on the terminal side or the map data stored in-vehicle terminal is updated with the newer map data.

Coarse-level map data is stored in the plug-in memory device card of the in-vehicle terminal, so maps can be displayed without downloading data, even when driving in locations where the communication environment is poor. In that way, the worst-case situation in which no navigation information can be provided at all is averted.

(2) Route guidance information distribution service

The route guidance information distribution service provides the suggested route of travel from the departure point to the destination found by the driving route assistance service information center and presents it in the form of a detailed road map with guide points. The in-vehicle terminal produces route guidance from the distributed route guidance information alone, so it is not necessary for the in-vehicle terminal to possess the maps. To ensure guidance up to the destination, information such as:

(a) intersection position and direction,
(b) intersection name,
(c) the name and direction of the object of guidance,
(d) road lane information,
(e) expanded view of intersections or expressway deformation guide maps that is needed for display or spoken instructions at guide points is distributed.

(3) Landmark buildings distribution service

The landmark building distribution service distributes information on landmarks of preselected items in the vicinity of a specified place. The in-vehicle terminal displays an image that corresponds to the

*Fig. 4—Appearance of IT Terminal.*
*This low-cost telematics terminal employs a plug-in memory device rather than a CD-ROM or DVD-ROM. Communication with the telematics center is accomplished via a cell phone.*

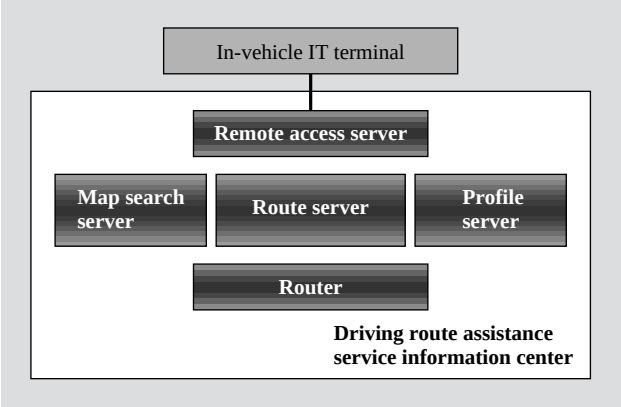


*Fig. 5—System Configuration of Driving Route Assistance Service Information Center.*
*To guarantee high reliability and high responsivity, a load-distributing cluster configuration is used for driving route assistance service information center system.*

distributed landmarks superimposed on the map.
(4) Telephone number look-up service

The telephone number look-up service finds the location of a building or residence that has the specified telephone number.
(5) Nearby facility search service

The nearby facility search service searches for the location of facility of the specified type that is nearest a particular place. The POI (point of interest) information for the facility or store that is located the shortest distance from the specified place is distributed.

### IT Terminal

An IT terminal that provides the driving route assistance service is shown in Fig. 4. This product was developed jointly by Nissan Motor Co., Ltd. and Xanavi Informatics Corporation. It comes on Nissan's new model series that were announced in Japan in February 2002.

Up to now, it has been necessary to purchase high-priced navigation terminals and adapters as a set in order to receive telematics services. The IT terminal described here is a 1DIN (German industrial standards)-size telematics terminal that
(1) does not use a CD-ROM or DVD-ROM,
(2) stores data in a plug-in memory device,
(3) employs a cell phone interface,
(4) has a CAN vehicle information interface, and
(5) is equipped with voice synthesis and voice recognition functions.

Simply connecting this terminal to a cell phone with a cable makes it possible to communicate with the driving route assistance service information center.

### Organization of Driving Route Assistance Service Information Center

The driving route assistance system is a navigation system that consists of a center that distributes car navigation information, including the latest map information and routing to destinations, 24 hours a day and 365 days a year. Positioned as an ASP (application service provider), the driving route assistance service information center must provide the same high reliability and responsiveness as a portal.

The configuration of the information center is illustrated in Fig. 5. The IT terminal connects to a remote access server via a cell phone to request car navigation information. The various machines in the driving route assistance service information center have a cluster configuration for load distribution, which prevents load concentration and system down time caused by one server failing or overloading.

Concerning the issue of data security, there is renewed recognition of the social problem of leakage of customer information through unauthorized access in the world of the Internet. The information center operates in a network that is independent of the Internet, and implements double and triple security measures to prevent unauthorized access.

## PROSPECTS

Hitachi is investigating development of the applications and features described below towards further expanding telematics services:
(1) Development of new applications that support safety and security: Development of traffic information services, remote diagnosis, emergency support, and

other new applications that utilize vehicle-control information

(2) Further advancement of the driving route assistance system: As increased capacity of database storage (memory devices) and higher communication speeds come into view, improvement of the convenience offered by the system through the relation of storage and communication functions.

(3) Adapting to broadband communications: Development of new applications that make use of third-generation wireless telecommunication systems, as represented by IMT-2000, and digital broadcasting.

## CONCLUSIONS

We have explained how Hitachi is grappling with telematics and described an in-vehicle IT terminal that has been developed to the product stage, as well as our driving route assistance system that employs in-vehicle information terminal.

Hitachi, together with Xanavi Informatics Corporation, will continue to position car navigation and the telematics business as a strategic field, and to apply our combined strength to actively develop competitive services and products.

### ACKNOWLEDGMENT

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