

Internet ITS

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Abstract

Based on the activities for the Internet ITS (Intelligent Transport Systems) that was started in FY2001, this paper is intended to introduce the Internet ITS Platform Specifications ("the PF Specifications) Ver. 2.0.0 released in 2006 and to discuss the present status of the Internet ITS Consortium. The paper will also include considerations of future development plans, including the efforts to be made by NEC Corporation.

Keywords

ITS, Internet, communication, vehicle information, car-mount system API
probe information, roadside service, content distribution service

1. Introduction

The Internet ITS is expected to provide the means for allowing vehicles to connect to the network from any location. It will provide drivers and passengers with improved services as well as enabling service providers more opportunities for delivering their services. The Internet ITS Consortium (IIC) was established in 2002 aiming at the diffusion of the concept of Internet ITS and establishing the fundamental concept and specifications that were needed to support it. Five years on, the consortium has more than 100 corporations and organizations joined under its management. As one of the founding members NEC has played an active role in the consortium since its establishment.

The existing Telematic Services connect each vehicle to the control center of each automobile manufacturer and/or to external networks by using a means of long-range communication such as the cellular phone. Whereas Internet ITS also assumes direct connection to stores, parking lots and general service/content providers. This concept has not been changed even at the present time in the age of NGN. In the following, we will introduce the general platform specifications of the Internet ITS and its past milestones as well discussing its projected future development.

2. Efforts toward Internet ITS up to the Present

In FY2001 before the establishment of the IIC, large-scale field trial were made in the Tokyo Metropolitan and Nagoya areas using 1,640 vehicles. Since then, the following course of development has been taken:

- FY01: Internet ITS field trial
- Oct. '02: Establishment of Internet ITS Consortium (IIC).
- Dec. '03: Publication of the Internet ITS Platform Specifications (PF Spec.) Ver. 1.0.0
- Mar. '04: Three-organization joint experiment presentation (Nagoya, Japan)
- June '04: Internet ITS in NAGOYA (held as an event accompanying the IIC general assembly in Nagoya)
- Oct. '04: ITS World Conference Nagoya-Aichi 2004 (Nagoya)
- June '05: Field demonstration on the Internet ITS Avenue (Sakae-dori, Nagoya)/Exhibition at ITS EXPO Tour (Nagoya)
- Nov. '05: ITS Special Exhibition (held at the Nagoya Motor Show in Nagoya)
- Dec. '05: Static verification test based on PF Spec. Ver. 2.0.0 (Tokyo)
- Dec. '05: First dynamic verification test based on PF Spec. Ver. 2.0.0 (Tokyo)
- Jan. '06: Second dynamic verification test based on PF Spec. Ver. 2.0.0 (Tokyo)
- Jan. '06: Joint demonstration experiment with the Mobile and Home Network System Forum (Yokohama)
- Mar. '06: FY05 Field demonstration & Exhibition of the consortium achievements (Tokyo)
- Apr. '06: Publication of PF Spec. Ver. 2.0.0.
- Mar. '07: FY06 Demonstration & Exhibition of the consortium achievements (Tokyo)

These activities served to universalize the interface (1. Common network specifications. 2. Common data specifications. 3. Universal on-board unit specifications (with universal APIs)) and to demonstrate the achievements in visible forms.

NEC also contributes to these activities in various ways



Photo Year 2006 demonstration.

including; operation of the probe center, compilation of the PF Specifications Versions 1.0.0 and 2.0.0, and participation in demonstration systems with on-board communication terminals (mobile routers).

Photo is an image of a demonstration using an NEC mobile router that was presented at the Field demonstration in March 2006. On this occasion, NEC used the NEMO (NET-

work MObility) described in PF Specifications Ver. 2.0.0 in switching between the service using a cellular phone during driving and that using wireless LAN during parking at a gas station. It thus demonstrated the effectiveness of the ubiquitous network connection in the world of IP (IPv6).

3. Internet ITS Platform Specifications Ver. 2.0.0

The Internet ITS PF Specifications Ver. 2.0.0 was published in April 2006. In the preparation of these specifications, the drafts of the Network Platform Specifications (Chapter 5), Common Service Platform Specifications (Chapter 6) and on-board unit Platform Specifications (Chapter 7) were first drawn up by the Platform Specifications Study Group based on the requirements defined by service providers. The specification demonstration experiments were then made using trial applications, and the specifications were finally established in the final publication. The PF Specifications are composed of a total of seven chapters. In addition to the chapters referred to above, chapters up until Chapter 3 describe the outline

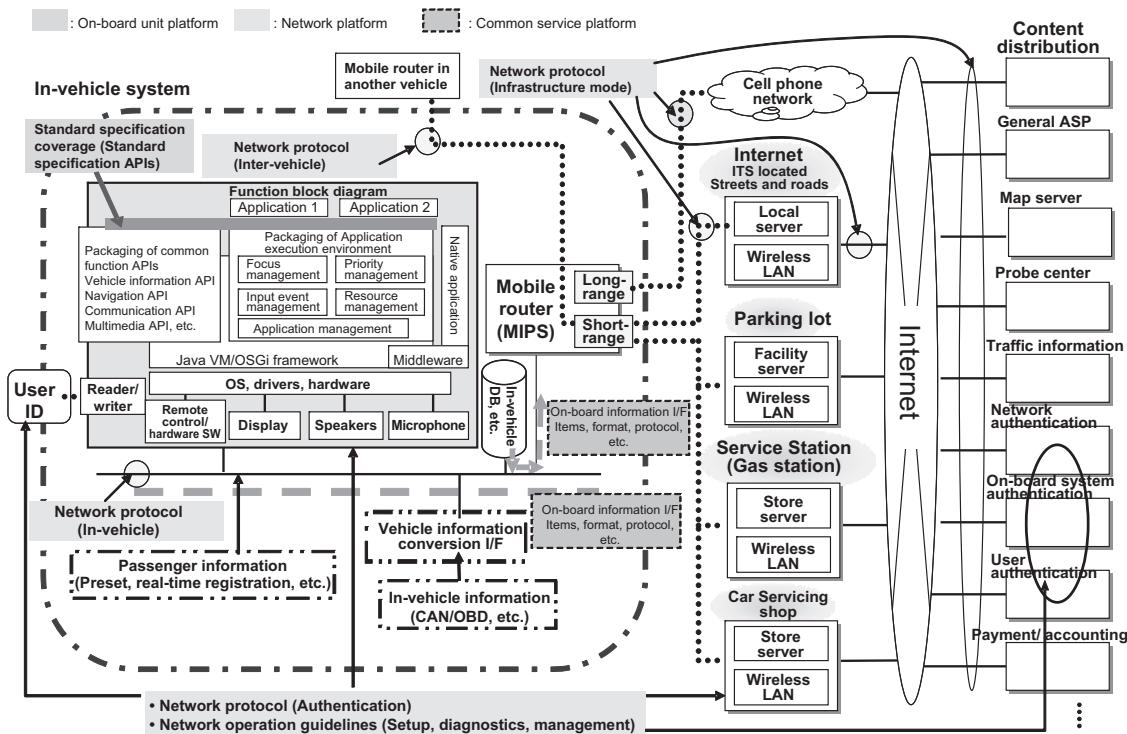


Fig. 1 Overview of Internet ITS specifications.

including the introduction of the concept and Chapter 4 lists the requirements defined by the service providers together with the outline of services.

The PF Specifications do not define the implementations of devices and systems but are positioned as the guidelines. Considerations are made so that they refer to the existing specifications whenever possible based on the recognition that the implementations belong to the competitive domain of member corporations and organizations. Fig. 1 shows an overview of the Internet ITS Specifications. It depicts the role of the PF Specifications defined in Chapters 5, 6 and 7. The area enclosed in alternate long and short dash lines indicates the in-vehicle system. The vehicle is expected to connect from there to the parking lot or gas station on the right, and also to the Internet in some cases directly or via a means of long-range communication, such as by a cellular phone. The Network Platform Specifications give guidelines on the following points (Fig. 2).

- Network layer, in-vehicle LAN (Fig. 2 - (1))
- Internet access (Fig. 2 - (2))
- Outside-vehicle AdHoc (Fig. 2 - (3))
- Authentication and security

The Network Platform Specifications are based on IPv6 and are described in order to reference the IETF standard specifications. For the mobility support function, they specify both the mobile IP (network connection when the terminal is mobile) and the NEMO (network connection when the network is mobile). The concept of communication media independency

is maintained from Ver. 1.0.0, with which the difference between media is absorbed in the IP layer. However, the specifications do not themselves define the communication media.

The Common Service Platform Specifications mainly define the data dictionary (data dictionary structure and data dictionary description method) of the vehicle information (probe information) (Fig. 3). The data dictionary is defined under the concept, “the information transmitted from vehicles and distributed through the network should ideally be standardized information that is independent of the manufacturer or vehicle type” so that vehicle information may be accessed by various people for various services.

The PF Specifications also define data containing the information usable in identifying individuals and vehicles (vehicle

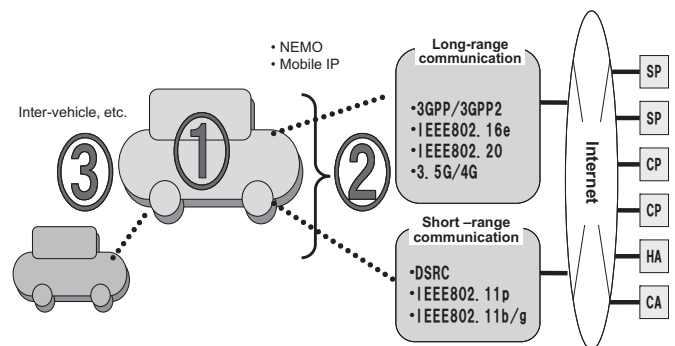


Fig. 2 Network platform specifications (Chapter 5 of the specifications).

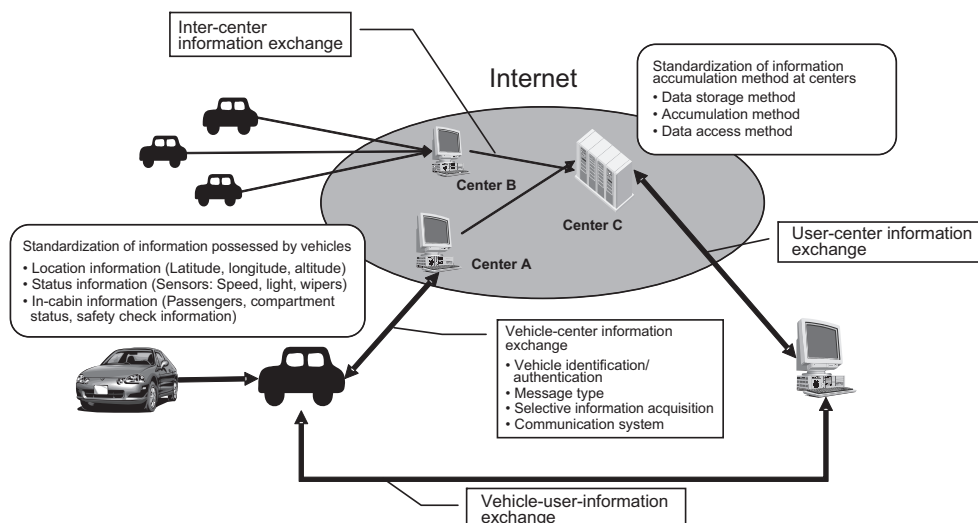


Fig. 3 Common service platform specifications (Chapter 6 of the specifications).

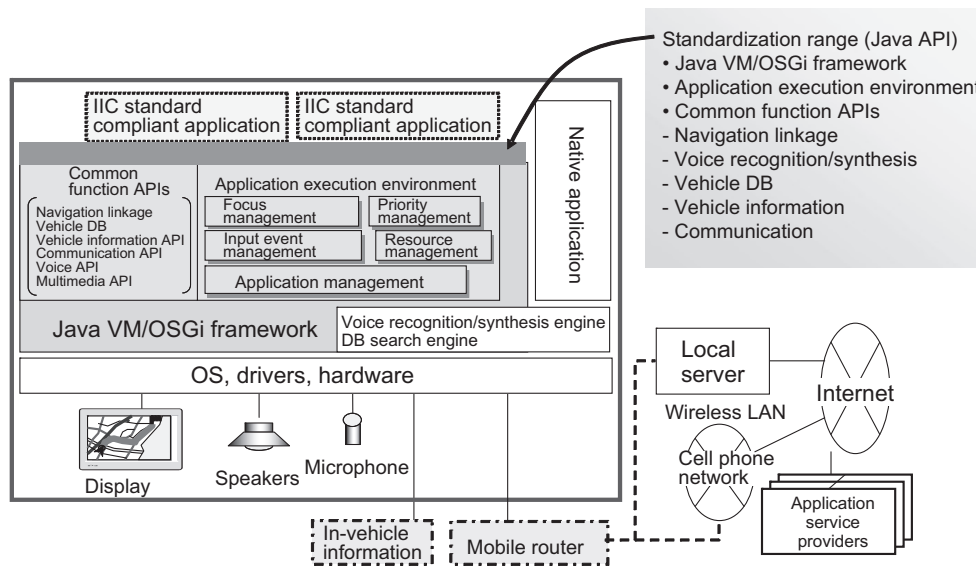


Fig. 4 On-board system platform specifications (Chapter 7 of the specifications).

ID, etc.) that is not defined in ISO TC204 from the viewpoint of personal information protection. This arrangement is because the Internet ITS also considers that the fleet management service assumes use for business purposes.

Although the vehicle outputs a large amount of sensor information, the vehicle information defined in the Specifications is limited to items that are necessary for implementing the services required by the service providers (75 items). In the future therefore, it could become necessary to add new items for the implementation of currently unknown services that have not been examined by the requirement definition of the service providers.

The currently defined vehicle information types include: the time, location, IDs, vehicle status, vehicle specifications, events during ride, and so on.

The On-board System Platform Specifications mainly define the concept of the APIs (Application Programming Interfaces) of the On-board systems (Fig. 4). The APIs are based on the Java/OSGi framework and are considered to facilitate software provisioning, etc. The defined APIs are as follows:

- Vehicle information API
- Navigation linkage API
- Voice recognition/synthesis API
- Communication API
- On-board database API

Descriptions of the APIs are given in an Appendix to the Specifications.

The Japanese language versions of the PF Specifications described above are publicized in the website of the IIC.

4. Future Development and NEC's Efforts

As the guidelines on the Internet ITS extend over a very wide range, implementation of all of them is expected to be a lengthy process. The most realistic way of practical implementation is therefore to adopt the specifications only partially. For example, in the development of an on-board system, the schedule is actually considered with regard to its introduction in the after-sale market, rather than mounting the system directly in the production line of the automobile factory from the beginning. Moreover, the considerable target products are not only those fixed in the vehicle but also include the portable terminals such as PND.

The activities of NEC are mainly focused on the communication domain and vehicle information (probe) equipment. For the communication domain, the Internet ITS has originally been developed assuming the use of IP (IPv6, particularly) and the basic policy remains unchanged. However, as many of the recent and planned safety systems are not based on IP, it has

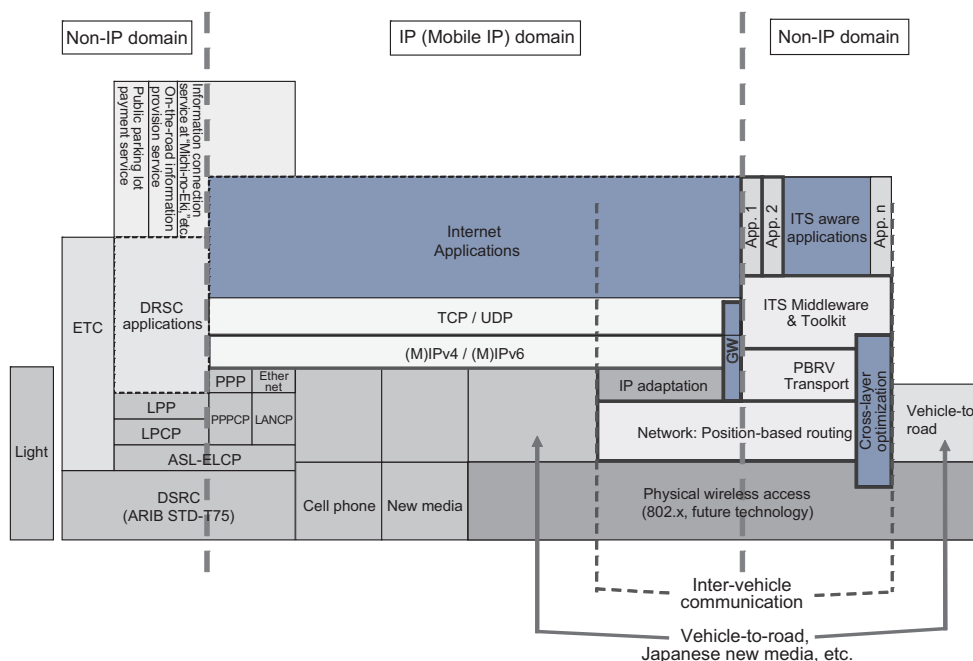


Fig. 5 Example of stack in NEC's car-mount communication protocol.

become one of the issues for the Internet ITS to build a system that can coexist with non-IP systems.

The on-board communication terminals of NEC are also developed to handle not only the IP traffic but also the non-IP traffic for the safety systems. Measures are also being taken to provide compatibility with short range inter-vehicle and vehicle-to-road communications using the IEEE802.11 communications (Fig. 5) as well as long-range communication such as the cellular phone.

5. Conclusion

As described above, nearly six years have already elapsed since the first field trial of the Internet ITS and the concept has spread more widely throughout society via the publication of specifications, field trial and by demonstrations as various opportunities are offered. Internet ITS is now entering the practical phase and NEC is determined to continue our efforts so that its essence may figure in many projects and that the published specifications (guidelines) are referenced by a larger number of people.

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