Technology Reports
Connected Car MaaS 5G
Special Articles on Next-generation Mobility Services

Toward Safer and More Comfortable Mobility Services for Anyone, at Anytime and Anyplace —Next-generation Mobility Services at NTT DOCOMO—

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The automobile industry is undergoing a once-in-a-hundred-years transformation owing to new areas of development known as CASE (connected, autonomous, shared, electric). These areas are driving efforts toward the creation of new businesses by a wide variety of players. Against this background, NTT DOCOMO is committed to "continuous provision of safer and more comfortable mobility services for anyone, at anytime and anyplace" as a vision for the future and to enhancing added value in user mobility.

1. Introduction

The automobile industry is undergoing a once-in-a-hundred-years transformation commonly referred to as "connected, autonomous, shared, and electric" (CASE[*1]). Here, "autonomous" and "electric cars" can help solve social problems such as the shrinking of the working population and environmental damage, and in the area of "shared" cars, Mobility as a Service (MaaS)[*2] that defines the concept of next-generation mobility can help solve mobility problems such as traffic congestion and CO_2 emissions. Interest is also growing in creating new means of mobility such as AI Bus[*3] and developing completely new business areas.

In addition, CASE assumes that cars will be "connected." In other words, all cars will be equipped with a communications function with the aim of exchanging various types of data and making movement more efficient while maintaining a continuous connection with the Internet.

In this regard, 5G is a technology that can be

*1 CASE: An acronym coined from the words "connected, autonomous, shared, and electric" corresponding to major trends in the automobile industry.
*2 MaaS: A new concept of "mobility" in which all means of transport are seamlessly connected and treated as a single service.

used in wide range of self-driving use cases thanks to features such as high-speed and large-capacity communications, low latency, and massive device connectivity. There is consequently growing interest in 5G not only from the automobile industry but also from a variety of players that wish to enter the connected car area.

In this article, amidst a greatly changing concept of mobility, we describe NTT DOCOMO's efforts in rolling out next-generation mobility services.

2. Connected Car Services

Beginning with a car phone service in 1979, NTT DOCOMO has grown together with the automobile industry through its development of a telematics[*4] module, creation of a global connectivity management platform, and provision of a variety of services including a vehicle movement management system and car navigation application. Now, with the coming of the CASE era, it intends to provide connectivity solutions to support the foundation of the mobility revolution and to bring the worldview of the smartphone—one of its major fields—to the automobile as only NTT DOCOMO can do.

For example, NTT DOCOMO is studying an "on-vehicle embedded Subscriber Identity Module (eSIM)[*5] for consumer devices" as one means of achieving a new mobility experience that seamlessly connects smartphone and car. This on-vehicle eSIM for consumer devices will make it possible to remotely write a profile (subscriber information) to on-vehicle devices supporting an eSIM for consumer devices from the user's own smartphone. Additionally, by linking the smartphone's contract and profile, it can bring the worldview of the smartphone that user's are already familiar with to the automobile as in in-vehicle voice communications, mobile data communications, and content services.

3. MaaS at NTT DOCOMO for Optimal Transportation

Countries around the world are actively promoting MaaS initiatives that propose optimal movement tailored to regional characteristics. At NTT DOCOMO, we are focusing our efforts on making user movement more convenient and solving social problems and on achieving an on-demand system based on the use of Artificial Intelligence (AI) in taxi and bus services.

"AI Taxi" uses past ridership data and statistical location data of people to predict taxi demand up to 30 minutes ahead and provide that information to taxi drivers. In this way, taxi drivers can get a feel for ride demand that changes in real time and thereby improve productivity through efficient operation. AI Taxi is also expected to shorten wait times for riders.

NTT DOCOMO has also developed "AI Bus" on-demand transportation targeting areas lacking a built-up public transport network. The idea here is to achieve a new means of transportation that can make the operation of transport companies more efficient while also making transportation more convenient for users. AI Bus will make it possible to provide high-quality movement tailored to the needs of users.

In the above, we have described two transport

*3 AI Bus: AI Bus and its logo are trademarks or registered trademarks of NTT DOCOMO, INC.

*4 Telematics: Refers to "information provision services for automobiles" consisting of the transmission of various types of information from an information provider to the driver and the transmission of operation and driving information from the car. "Telematics" is a coined word combining "telecommunications" and "informatics."

*5 eSIM: An embedded SIM that enables the remote writing of telecom carrier information.

systems as MaaS initiatives that have already been put into use. Looking forward, we aim to create new "movement × services" businesses that link peripheral services such as retail shopping and medical care with transportation. Here, instead of the conventional approach of simply collecting the price of movement as fare, a new model might be to pay transport companies a fee for referring customers to such commercial establishments as revenue sharing*6.

4. docomo Smart Parking System

Recent years have seen initiatives in a variety of industries on using ICT to optimize existing social systems. As part of this trend, NTT DOCOMO has taken up the challenge of open innovation with the pay parking industry in the form of a "docomo Smart Parking system™*7" project.

With this system, a driver in need of a place to park can use a dedicated smartphone app to reserve and use an empty parking space in a parking lot. In this way, the inconvenience of having to look around for a parking lot displaying "space available" while driving near one's destination can be avoided and the risk of an accident decreased. In addition, payment after use can be automatically performed through a means of settlement tied into a previously registered driver's account so that the driver can leave the parking lot immediately without having to wait for settlement processing.

This system is also equipped with a management system for parking-lot operators that enables online, real-time settings such as changes in parking rates, temporary suspension of parking lot use on specific days or time slots, etc. In this way, the system reduces the burden of parking-lot management tasks even for parking-lot operators using scattered idle land and expanding in a decentralized manner.

5. Toward a Safe Self-driving Society

With a view to the self-driving era of the future, NTT DOCOMO has undertaken a "cellular Vehicle-to-Everything (V2X)*8" initiative as technology for contributing to an even higher level of safety. "High-reliability, low-latency direct communications technology connecting vehicles to everything" as prescribed by 3GPP is expected to improve vehicle communication ability as a complement to vehicle sensor technology so that an even broader range of information can be detected and peripheral conditions recognized even in non-line-of-sight environments.

In addition, we can expect 5G to be an elemental technology that will not only enable the use of large-capacity data such as real-time traffic information and digital maps but also provide significant driving support as in remote operation of self-driving cars. NTT DOCOMO intends to make the most of 5G to bolster its efforts in creating a smooth and secure self-driving society.

6. Conclusion

In this article, we described an overview of connected car services, MaaS, docomo Smart Parking system, and V2X as NTT DOCOMO initiatives in next-generation mobility services. We ask the reader to refer to other special articles in this issue for detailed explanations of the services and technologies introduced in sections 3 – 5 above [1] – [3].

*6 Revenue sharing: The sharing of obtained profit at an allocation rate determined beforehand between the business enterprises of concern.

*7 docomo Smart Parking system™: A trademark of NTT DOCOMO, INC.

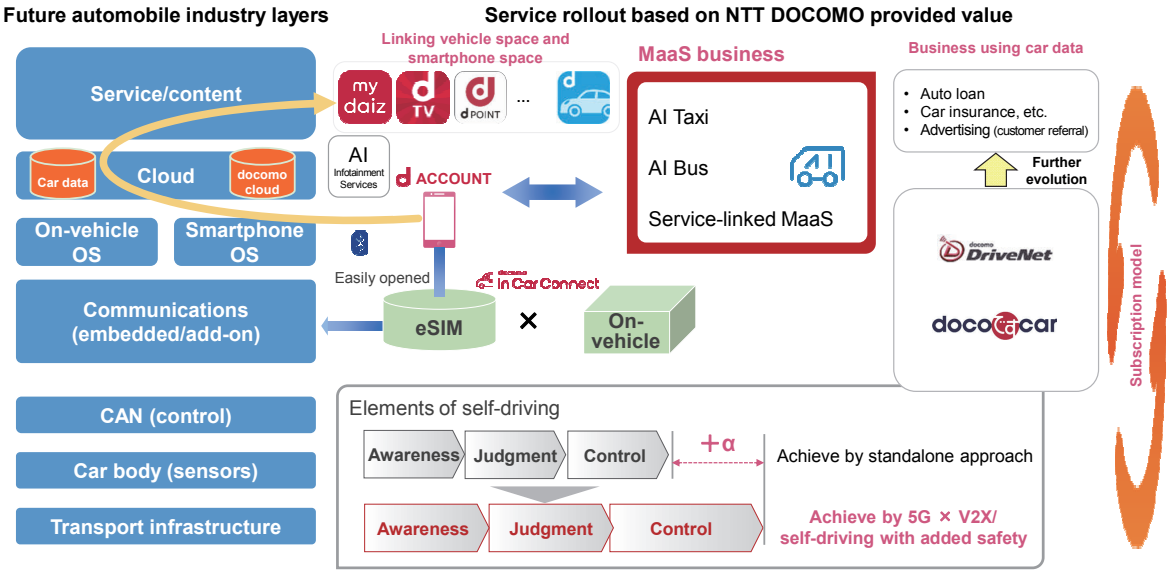

Figure 1 NTT DOCOMO initiatives in next-generation mobility

Today, as reforms proceed toward next-generation transportation as reflected by CASE and MaaS, NTT DOCOMO is committed to providing safe and smooth mobility services and to finding solutions to social problems in the area of transportation. Furthermore, in addition to providing communication environments, NTT DOCOMO aims to create new business fields and provide new value together with co-creation partners on diverse layers of the automobile industry from transport infrastructure to automobile-related services (**Figure 1**).

REFERENCES

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*8 V2X: A generic name for Vehicle-to-Vehicle (V2V) direct communications between cars, Vehicle-to-Infrastructure (V2I) direct communications between a car and roadside devices (radio communications equipment installed along a road), Vehicle-to-Pedestrian (V2P) direct communications between vehicles and pedestrians, and Vehicle-to-Network (V2N) wide-area communications via base stations in a cellular network such as LTE and 5G.