Automotive Edge Computing Consortium—a Global Effort to Develop a Connected Car Platform

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Abstract

NTT launched the Automotive Edge Computing Consortium with various global partners, namely, DENSO Corporation, Ericsson, Intel Corporation, NTT DOCOMO, Toyota InfoTechnology Center Co., Ltd., and Toyota Motor Corporation, in order to develop technologies for connected cars using automotive big data. The objective of the consortium is to form an ecosystem for connected cars to support emerging services such as intelligent driving, the creation of maps with real-time data, and driving assistance based on cloud computing.

Keywords: edge computing, connected car, automotive big data

1. Introduction

Safer driving, minimized traffic delay, effective resource consumption, and a lower level of air pollution are some of the demands of the future society where a profound increase in mobile telecommunication usage for connected cars is expected. In advanced automotive services such as intelligent driving, data generation for real-time maps, and cloud-assisted driving, it is expected that a huge number of data transfers between connected cars and the cloud will be inevitable. By 2025, it is predicted that the amount of data exchanged between connected cars and the cloud will reach 10 exabytes per month [1]. This is 10,000 times the amount of data exchanged today. Thus, technologies such as distributed networking and system architectures with computing resources that can accommodate the processing of a huge amount of data are needed.

To enable the fulfillment of these demands and to promote the widespread use of the new technology, NTT, alongside DENSO Corporation, Ericsson, Intel Corporation, NTT DOCOMO, Toyota InfoTechnology Center, and Toyota Motor Corporation, established the Automotive Edge Computing Consortium (AECC) [2].

2. Issues in developing connected car platform

A capacity issue arises with the current mobile network and cloud computing system in accommodating a large number of connected cars effectively. In a network topology expressed in a tree form as the basic architecture of a mobile network, traffic on such a network converges at the narrow top end, and this causes a huge concentration of data from/to connected cars. Moreover, data concentration is an even more serious issue because the current cloud computing is also located at converged datacenters. These heavy concentrations of data cause a slow response time and long processing time between connected cars and the cloud system and are an obstacle to implement a platform to serve a large number of connected cars.

Therefore, the purpose of the AECC is to design a system architecture for a connected car platform to convey and process a huge amount of data with an appropriate network and assignment of computing resources (**Fig. 1**).

3. Concept of AECC

One solution to the aforementioned issue is to

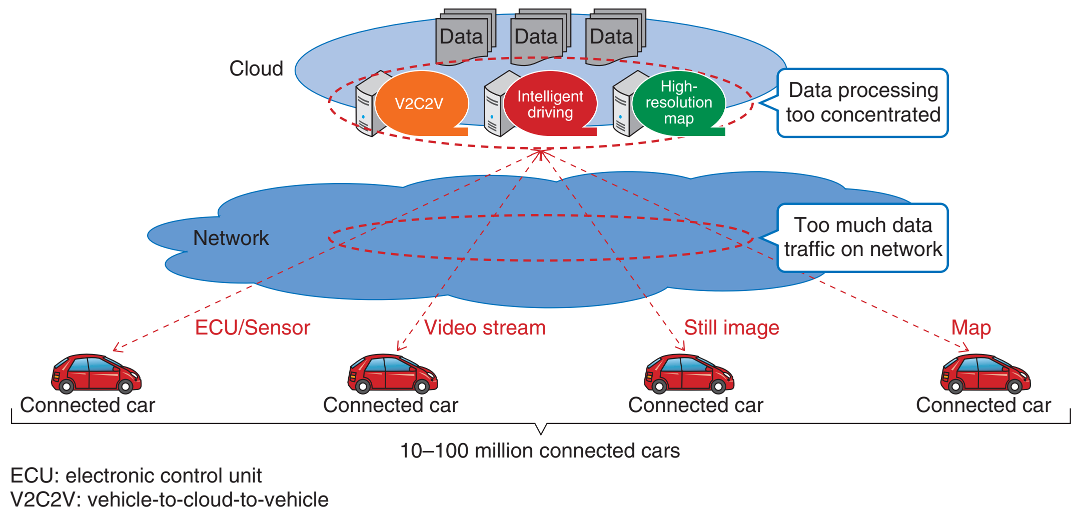

Fig. 1. Issues of current mobile network architecture [1].

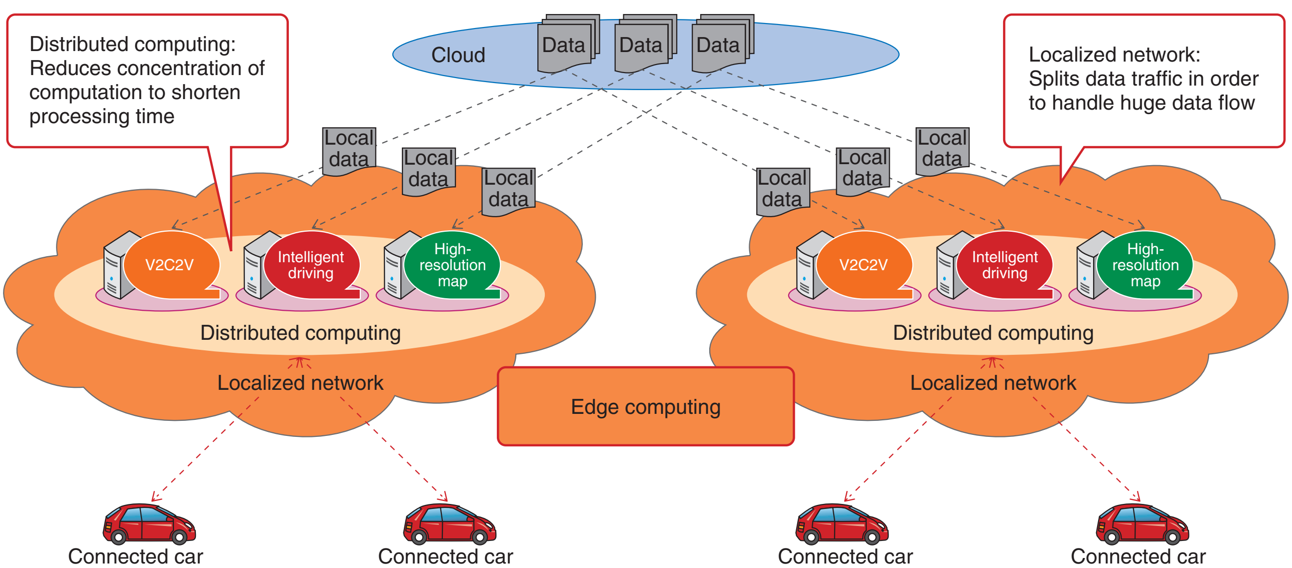

Fig. 2. Utilization of edge computing [1].

distribute computing resources on a localized network. When computing and network resources are distributed locally, each local system can handle a small amount of data traffic and implement timely responses to connected cars.

The distributed network and computation features of edge computing make it a promising technology that could be adopted to realize this concept. The network is designed to split data traffic into several localities that cover reasonable numbers of connected cars. The computation resources are hierarchically distributed and layered in a topology-aware fashion to accommodate localized data and to allow large volumes of data to be processed in a timely manner (**Fig. 2**).

Edge computing technology will thus provide an end-to-end system architecture framework used to distribute computation processes to localized networks. Therefore, the AECC will focus on increasing capacity to accommodate automotive big data in a

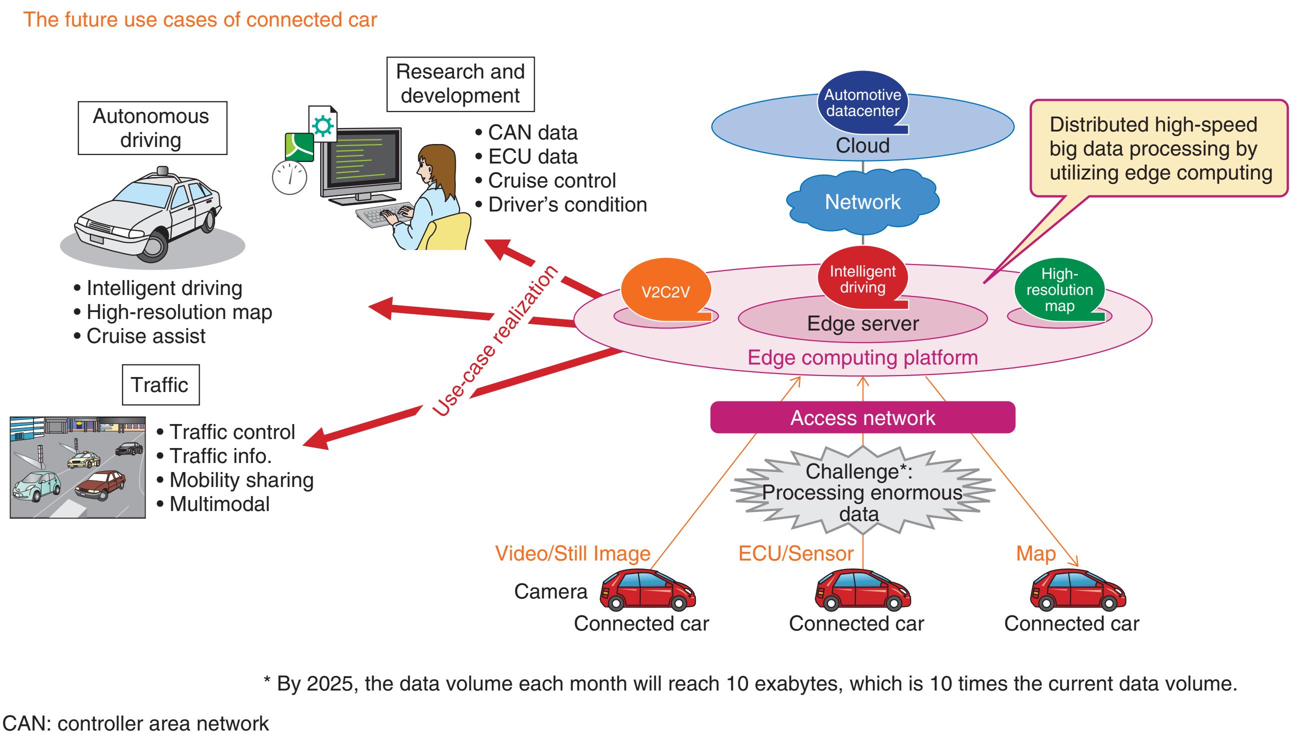

Fig. 3. Concept of AECC.

reasonable fashion between vehicles and the cloud by means of edge computing technology and more efficient network designs. The consortium will define requirements and develop use cases for emerging mobile services, with a particular focus on the automotive industry (**Fig. 3**).

4. Global spread of technology

There are important steps needed to realize AECC's vision, starting with developing and implementing technologies surrounding connected cars on a global scale, fostering the global acceptance of a common system architecture, and involving related industries in the construction of the architecture. To achieve this mission, we brought together partners from different fields of industry including automotive, telecommunications, and information technology to establish the AECC. With a strong global partnership, we want to push our requirements as an input to standards developing organizations and industry bodies to achieve global standards. In concrete form, we want to endorse the aforementioned edge computing, networks, and architecture to accommodate huge volumes of traffic and the creation of corresponding analysis tools for data processing to realize intelligent driving, data generation for real-time maps, and cloud-assisted driving. For that reason, we will continue our efforts in defining the requirements for the system architecture and creating the necessary platform that will enable future automotive services.

References

[1] Automotive Edge Computing Consortium (AECC) White Paper, "General Principle and Vision," Version 1.0.0, 2017. https://aecc.org/wp-content/uploads/2017/12/AECC_Whitepaper_v1.0.0.pdf
[2] Website of AECC, https://aecc.org/

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After joining NTT in 2004, he researched and developed an Internet of Things application based on software technologies such as the OSGi (Open Services Gateway Initiative), OpenStack, and edge computing. He is a member of the Institute of Electronics, Information and Communication Engineers (IEICE).