Cloud computing for handling data from traffic sensing technologies and on-board diagnostics

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Abstract

Based on a complete understanding research in Information and Communication Technologies (ICT), the Intelligent Transport Systems rapidly build up innovative applications to ensure real time attainment as well remote management of driven information, provide a huge range of services and involve many actors in automotive ecosystem. In this paper, we present an intelligent cloud computing for handling data received from traffic sensing technologies. Transportations technologies applied in ITS have played a great role in collecting data from devices deployed in vehicles and highway infrastructures utilizing broadband wireless technologies to the Cloud. In order to facilitate the interested in automotive industry to use data collected and afford services to the car's owner, a scalable acquisition, access to computing resources and offered services are the primary goal of the proposed cloud computing.

키워드

Intelligent Transportation Systems, Traffic sensing Technologies, cloud computing, public cloud computing, private computing, on-board diagnostics

Ⅰ. Introduction

Automotive industry has recently deployed enough resources to build efficient car that is most comfortable, equipped by several functions which will allow car's owner dealing with all interested in automotive ecosystem such as vehicle manufacturing[1], vehicle repair, Vehicle Dealer ship management, vehicle logistics, emergency services, insurance companies, then benefit several services from them. Moreover, over the years, there have been regular development in ITS to improve safety, transportation management service to regulate traffic. Recently, we have witnessed the introduction of broadband wireless communications technologies [4] such as WIMAX, UMTS, 3G, 4G LTE and the proliferations of wireless local Area Network. These broadband wireless technologies claim to facilitate the connection of vehicles with the Internet. Moreover, the revolution observed recently in Information technology has implicated a huge number of standardized information and communications technology capability such as software, Information technology infrastructure afforded by different services providers that are accessible anywhere via Internet, always available to the end user when he needs them, making collection of data from several sensors units, facilitating reliable processing and easier storage of data collected. Those IT capabilities are faster and more economical. The data collected through traffic sensing technologies and on-board diagnostics are stored to concentrated or distributed cloud computing to be used by some organizations such as car manufacturers to monitor performance of vehicles sold in the market by leveraging reporting of Diagnostic Troubles codes (DTC), status diagnosis information,

emergency services management to locate and help victims of accidents or injured person, traffic transportation authorities to increase safety, accident prevention, car repair to analyze vehicle diagnosis in real time while the vehicle breaks down.

II. Challenges and contributions

However, much anxiety reported around cloud computing for handling data received from traffic sensing technologies and on-board diagnostics is concentrates on what kind of services can be afforded and how much it will cost to access computing resources and offered services via wireless communications infrastructures, access secured to individual information of car's owners, level of authorization to the resources shared by interested actors in automobile industry. Moreover, uncertainty, unreliable world widely identification of vehicle's owner by all interested in automotive industry, agreement services between OEMs and others partners, downtime of cloud web services constitute also a challenge. The major contributions in this paper are the following: we propose: 1) private cloud computing platform for data captured from traffic sensing technologies and on-board diagnostics; 2) public cloud computing platform that makes available ITS users services 3) vehicular diagnostics software as a service designed using android SDK as aftermarket application hosted in the private cloud that reports vehicle diagnosis data to the driver via android based smartphone or user-friendly web portal.

III. The proposed Cloud Computing

Cloud computing can be featured into private and public cloud [2]. Cloud computing provides processing and management platform, allows services made available to users on demand via internet from a cloud computing provider's servers [3]. Cloud providers are designed to offer a scalable access to applications, services and resources. Traffic sensing technologies have task to release real time traffic information, traffic status judgment trough video images to the cloud computing. In fact, the cloud computing we carry forward is a private cloud computing. The proposed private cloud computing is responsible for the following activities: 1) collect data from traffic sensing technologies and on-board diagnostics [6]; 2) storage of data acquired and data after analysis which consists to determine services providers need it the most; 3) management that consists to set organization, level of access and authorization profile to retrieve, update or maintain data collected. Public cloud computing features services regarding vehicle owner's registration, schedules services between applications and content services providers; add proposal product from them, control access, roles, rights granted to them, safely delivered of services to car owners. Moreover, through proposed public cloud computing, traffic management center forwards ingoing traffic and highway information to drivers so that they can obtain real-time information that suggests the best route, download precise information about destinations, receive live update route on their vehicle infotainment device. The whole proposed cloud computing is reported on the figure 1

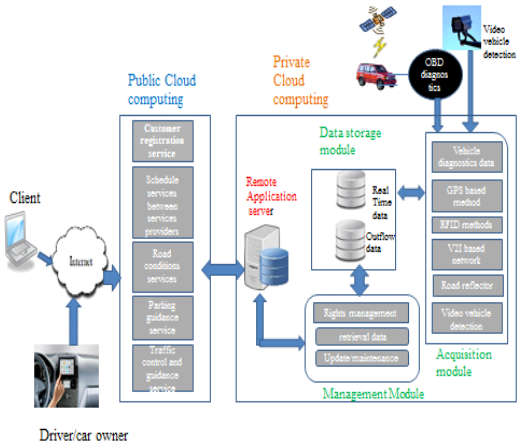

Fig.1. Structure of cloud computing for handling data from traffic sensing technologies and on-board diagnostics.

IV. Case study Remote Vehicle Diagnostics Software as a service offered by automotive industry

Remote vehicle Diagnostics Software as a service is downloaded by the vehicle owner via his mobile device. After downloading, he can start use it by connecting the Bluetooth OBDII scan tool adapter into OBD-II car's connector.

Collection and transmissions of vehicle data

and remote monitoring web portal

4.1 Data acquisition and Storage

Global Positioning System (GPS) is practical and enables vehicle to be positioned and navigated by using GPS positioning satellite. Once the connection with the android based smartphones is established, it starts request data and the action is performed in background services. vehicle OBD-II diagnosis data that have collected, along with the global vehicle identification number loaded from android smartphone's memory after the user has registered them within the application and vehicle location (latitude, longitude) that corresponds to the current position of the vehicle provided by the GPS are then saved in the database locates in automotive industry's datacenter in the format of JSON objects through HTTP protocol. The figure 2 shows data storage validation algorithm.

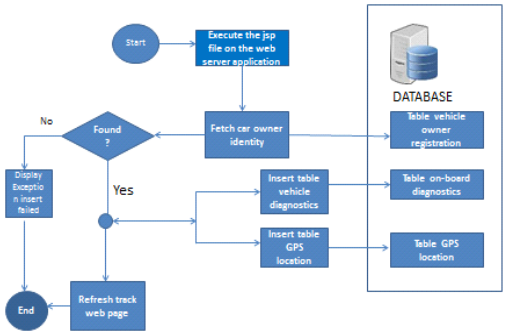

Fig.2 algorithm for inserting new vehicle diagnostic data into real-time database.

4.2 Remote monitoring on the web portal

The main idea of user-friendly front end web portal is to track down; monitor on board diagnostics data that are already uploaded periodically from android based smartphone from different car owners in the cloud. Car owner can decide to share on board diagnostics data with services providers that offer up services. The vehicle owner can promptly through android based smartphone retrieve and save its own vehicle diagnosis data at any time and share them with the vehicle repair house while vehicle exposes malfunction indicator lamp also known as check engine light[5]. The front web page allows also vehicle owners to have an idea of where they have been by analyzing Google maps which displays the path they took via various markers that correspond to the various locations provided by the global Positioning System (GPS). The figure 3 describes the information available on the web front web portal.

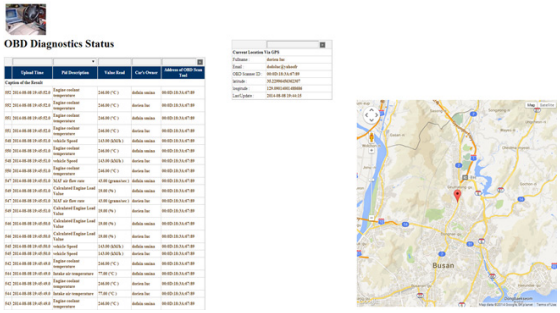

Fig. 3 screen of current update of on board vehicle data, location information and Google map

Ⅴ. Conclusion and Future work

In this paper, we argue that concerns about uprightness of data from traffic sensing technologies and on-board diagnostics are a major step for vehicle owners, authorities and businesses looking to take up cloud computing that enables value-added and others services. We present a cloud computing which enables data acquisition in private cloud computing. A remote vehicle diagnostics software as a service attests the concept of vehicle to cloud capable of collecting diagnostics data. Our next purpose is to implement a fully prototype to evaluate others value-added services.

감사의글

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