CARSTREAM: AN INDUSTRIAL SYSTEM OF BIG DATA PROCESSING FOR INTERNET-OF-VEHICLES

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Abstract- ***As the technology is growing day by day, Internet of Things (IoT) is also spreading into various fields like automobiles, telecommunications, education, agriculture etc. IoT in the field of Vehicular Technology is called as Internet of Vehicles (IoV). Internet of vehicles has become an increasingly important trend for future transportation and communication between vehicles. Due to this fast updation of technology, modern vehicles are expected to be connected with other devices or with their surrounding environment. In this project, we address the challenges in designing a scalable IoV system by describing CarStream, an industrial system of big data processing for chauffeured car services. CarStream collects and processes multiple types of driving data including vehicle status, driver activity and passenger trip etc. Each car sends this information to its database. IF there are 10 cars on a street, the database receives 10 applications of information. Imagine if this number increases to thousands and it becomes a bottleneck to the database to store or retrieve the information. By significantly expanding the network scale and conduction both real time and long term information processing are evolved. Vehicles are not only consuming but also generating a huge amount and enormous types of data, which are referred to as Big Data. Since it is believed that 1/5th vehicles on roads will be connected to internet by the end of 2020.***

Index Terms- ***Big data, chauffeured car services, Internet-of-Vehicles (IoV).***

INTRODUCTION

In recent times, Internet of Things technology has emerged as an important research and application area. As a major branch of IoT, Internet of vehicles has drawn great research and industry attention. Recently, the cloud based IoV has benefited from the fast development of mobile networking and Big data technologies. Different from traditional vehicle networking technologies, which focus on vehicle to vehicle communication and vehicular networks, in a typical cloud based IoV scenario, the vehicles are connected to the cloud data center and upload vehicle statuses to the center through wireless communications. The cloud collects and analysis the uploaded data and sends the value-added information back to the vehicles. Similar to other IoT applications the vehicle data are usually organized in a manner of streaming. Although each vehicle uploads a small stream of data, a big stream is merged in the cloud due to both the high frequency and the large fleet scale. Therefore, a core requirement in this cloud-based IoV scenario is to process a stream of big vehicle data in a timely fashion. However, to satisfy such core requirement, there are three main challenges in designing a large-scale industrial IoV system to support various data-centric services. First, the system needs to be highly scalable to deal with the big scale of the data. Unlike other systems, the data in IoV are mostly generated by machines instead of humans, and this kind of data can be massive due to high sampling frequency. Second, the system needs to make a desirable trade-off between the real-time and accuracy requirements of data-centric services when processing large-scale data with low quality and low density of value. Remarkable redundancy exists in the data due to the high sampling frequency, which causes the low density of data value. However, such data should not be simply removed because it is challenging to identify which data will never be used by any supported service. Third, the system needs to be highly reliable to support safety-critical services such as emergency assistance. Once a service is deployed, it needs to run continuously and reliably along with the data keeping coming in. Unexpected service outage may cause severe damage of property or even life loss.

ARCHITECTURE

The traditional solution for all the Iov applications is database centric design. Such architectures generally adopt the relational database for uploading driving data since the services implemented are based on queries of database.

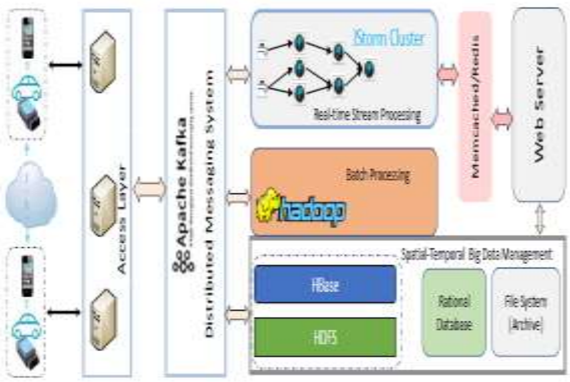


Fig: overview of architecture of IoV devices

BIGDATA SUPPORT IN IoV

The IoV data can be from vehicles, passengers, roadside facilities and internet. This generated data by vehicles can be categorized into 2 streams; on-board and on-road data. The on-board data which monitors the vehicle status can be obtained directly from in-vehicle sensors. The on-road data refers to the event information happening on road and can be collected from the on-road sensors.

Transmission of this Big data is challenging because of various types of data and huge volumes of the data. Hence, adopted two methods; push based model and pull based model.

In Push based model, the messages are broadcasted to required destinations where plain flooding is the simplest way of broadcasting. Here, vehicles broadcasts the message data packets in one-hop and all the receiving neighbors will broad cast the messages in return. In pull based model, request replay method is followed.

It is predicted that there will be more than 200 sensors on future vehicles in 2020 and around 4000 GB data will be generated every day. Hence, the big data transmission models are needed for IoV device data transmissions and communications.

SCOPE

Since, the theme of the project is very vast, we are limiting its scope to storing the gps locations and sending messages to the passengers when requested.

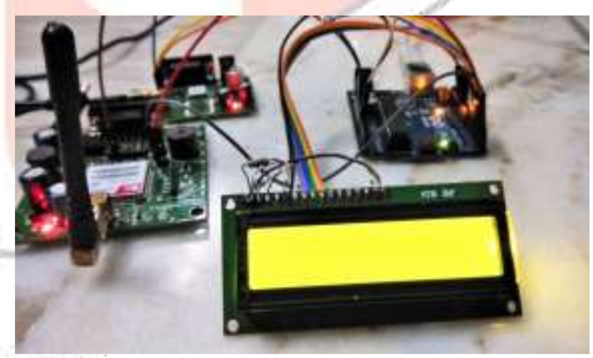
IMPLEMENTATION DETAILS

1. VECHICLE TRACKING USING GPS AND GSM MODEM

Fig: Data processing and storing location

We can track the vehicle and get its location using gps and gsm modem. All the data is stored in database. The equipment used are Arduino microcontroller, Gps module,

The Arduino UNO microcontroller is used to control the vehicle tracking system. A software program is written, compiled and then saved in the microcontroller's flash memory. The GPS (Global Positioning System) is used to provide certain information like location co-ordinates, speed etc to the users. The GPS module has the GPS receiver with antenna. The GSM module is responsible for establishing connections between an in-vehicle device and a remote server for transmitting the vehicle's location information.



2. SENDING MESSAGES TO THE PASSENGERS

The users can even receive the location details of their vehicles through messages. All they need to do is, send a request message to the number specified in the vehicle booking details.

One of the key features of the GSM is SIM (Subscriber Identity Module). This helps to send the messages to requested customers when they request for the location details. This replaces the use of wifi and makes the connections simple.

Fig: Screenshot of messages sent and received for location details

CONCLUSION

The need for Big data for IoV and their future requirements is stated. One of the implementations of the IoV i.e, the vehicle tracking system and its data processing is described in this paper.

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