

Research of Traffic Safety Management System Platform based on Cloud Computing

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Abstract: Information technology is becoming more and more mature, but the road traffic problems have become increasingly prominent and collecting useful information on traffic safety and will these information analysis and processing has become one of the effective ways to deal with the traffic problems. Traffic safety information is collected in order to effectively manage traffic and provide effective help for urban visitors. Therefore, this paper attempts to establish an opportunity to cloud computing traffic safety information platform, it as a bridge between traffic management personnel and the public. The traffic safety information platform established in this paper can be quickly adapted to the background traffic situation.

Keywords: Traffic safety; Cloud computing; Traffic problems

1. Introduction

Due to the accelerated process of urbanization, the traffic situation is becoming a great threat to road safety. According to statistics, every year around the world due to traffic accidents caused by the loss of up to 50 million - 120 between. China has witnessed around 500, 000 annual traffic accidents averages and more than 100, 000 death toll closely associated with road accidents in the past few years unfortunate to stand second to none in the world. According to statistics, road traffic accidents in 1990 became the sixth deadly reason. Therefore, the road traffic safety has been increasingly attracted the attention of the world.

Traffic safety has become a threat to human life and safety of the urgent problem, but also become an urgent problem to solve the transportation sector. So the establishment of road traffic safety information platform is a useful thing. Therefore, we attempt to design a traffic safety information management platform based on cloud computing, data warehousing and data mining, which serves as an excellent channel for communication between traffic authority, staff and the public. The principle of this paper to establish the traffic information security platform is the road safety information database and try to generalize, judgment and prediction of traffic accident black spots, the type of vehicle, accident and weather of safety information, to share with and effective traffic information, so as to effectively deal with traffic.

2. Related Technologies and Concepts

2.1. Cloud Computing

Cloud Computing can be used as a platform and one type of application program abreast of the latest computing development such as distributed computing, parallel computing and grid computing.

2.2. Hadoop

As infrastructure of distributed system, Hadoop is developed by Apache Foundation. Users can explore the distributed programs and make full use of cluster of high-speed operation and storage without knowing details about the distributed architecture substrates.

As can be seen from the Table 1, it contains a lot of components. We would here introduce only a few main modules such as Map/Reduce and HDFS aiming at tackling mass data.

Table 1. Hadoop component

HBase	Pig	Hive	Mahout	Avro
Map/Reduce		HDFS		ZooKeeper
Hadoop Common				

2.3. Hive and Mahout

Hive is a data warehouse platform based on Hadoop. By utilizing Hive we can easily realize data extraction, transformation and loading. Mahout is a distributed framework of machine learning and data mining, providing some classical algorithm in the extensible field of machine learning. It attempts to help developers create intelligent application in easier and friendlier way. Mahout contains many functions such as clustering, classification, recommend filtration, frequent sub item mining. In addi-

tion, Mahout can effectively spread to the cloud by means of Apache Hadoop library.

3. Problems and Construction Mode

3.1. Weaknesses

Public traffic information service has been in the lime-light worldwide. However, there are still a lot of weaknesses in this area:

- (1) Drawback of service content, approach, quality and range. The present service content mainly touches upon travel information and service approach is considered to be outdated and thus leave much room for improvement.
- (2) Limited information service ability. At present most information services rely on government and information gathering, tackling, and releasing are independent to some extent, what's more information content seems to be simplistic and impractical.

Given problems above, we try to establish a traffic safety information platform based on cloud computing for local traffic authorities and the public through establishing traffic safety knowledge system peculiar to Beijing. With the platform any users can connect cloud service platform with their own terminal equipment and keep them well informed of any traffic safety information they are concerned about. At the same time we strive for accurate analysis of these information and recommend to those people sharing the same interest targeted at promoting the sharing and transmitting of traffic safety information and knowledge in society at large and further establishing traffic safety information platform based on cloud computing.

3.2. The main research content

During the implementation of the project, we bring many research approaches and experiment means into focus, that is, cloud computing, data warehousing, data mining. We attempt to design a traffic safety information management platform based on cloud computing, data warehousing and data mining, which serves as an excellent channel for communication between traffic authority, staff and the public (Gray, 2011). It aims to take full advantage of road safety information database in attempt to generalize, judge and predict various safety information such as traffic accident black-spots, vehicle types liable to serious accidents and weather based on already occurred accidents on one hand and gather, tackle and share detailed traffic conditions without delay such as road condition, potential risks, accidents, disasters and weather on the other hand.

There are three key technologies:

Cloud storage of massive traffic data. Use large-scale distributed cloud storage structure to store all information including images, audio and video files with regard to

traffic safety accidents and ensure quick and safe access to all information.

Accurate analysis and recommendation of massive traffic data. Based on the processing platform of distributed mass data users can data mine and analyze traffic safety information after extracting, organizing, analyzing and processing structured mass information in order to recommend them to relevant users.

Cloud terminal technology. Support various mobile terminal including mobile phones, pad and customized cloud terminal in diverse interactive forms so that users can use cloud services anytime and anywhere and share traffic safety information.

3.3. Architecture design of intelligent traffic safety information platform based on cloud computing

Based on the awareness and understanding of above problem, we attempt to design the following system structure.

From Figure 1 can be briefly explained as follows. Those mass data gathered by each branch system often result in irregular pattern, which is more appropriate for cluster analysis. Due to the large scale of user data, we decide to adopt Hadoop for parallel computing and distributed storage. Besides, to improve the utilization rate of resources we have realized the virtualization of server layer, built traffic information security knowledge based on all kinds of data mining algorithm with Mahout and design mobile terminal access for solving all kinds of cloud terminal access in the application layer. Only in this way can we ensure users get access to cloud computing traffic safety information platform which is based on Citrix XenDesktop via any tablet PC, smart phones, PC, Mac and thin clients.

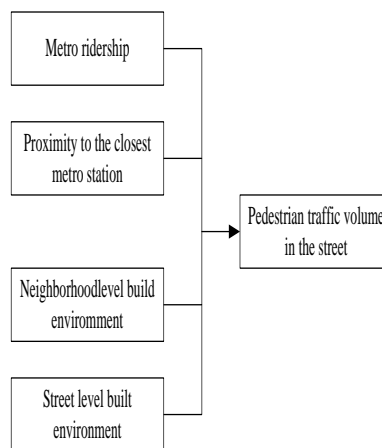


Figure 1. Architecture design of intelligent traffic safety information platform based on cloud computing

3.4. Application case

Due to complicated factors in relation to traffic safety, it is not easy to reach a consensus on the definition and

standard of traffic accident. More important, there is no widely accepted effective algorithm on account of incomplete statistical data so far. This paper attempts to confine influencing factors of road safety in a grey domain by adopting clustering algorithm and evaluate overall level of road traffic safety based on information screening, processing, extension and expansion. The procedures will be as follows:

To start with, we should be aware of the actual situation of data source, design target data and select desired attribute of influencing factors of traffic accidents after ETL processing based on Hadoop, which include data extraction and transformation. The final step is cluster analysis. Format conversion: Data format must be transformed into the input format that can be handled by clustering algorithm. What clustering algorithm can deal directly with the format is sequencefile in Mahout. So we should write a Class which is used to convert the format into sequencefile file:InputMapper and a Map function to implement Input Mapper. Map function is defined as follows:

- (1)Invoke Apache Mahout
- (2)Invoke parallel clustering algorithm of Mahout, which contains a couple of clustering algorithm.
- (3)In this paper K – means clustering algorithm is a case in point.
- (4)Obtain the clustering results of HDFS
- (5)After finishing clustering algorithm, we still need analyze the clustering results. Namely, obtain the results directly in HDFS by Hive and extract them to local client for analysis.

4. Conclusion

Cloud computing theory value and practical value in the field of traffic safety management has been a greater degree of play, but the beginning of this practice is very not easy. Therefore, this paper here called for everyone for Cloud Computing in the application of road traffic safety need to pour more focus.

At the same time, the development of cloud computing in logistics and other industries will also promote its development in the field of road traffic safety, so it should be the development of deep mining cloud computing in various industries.

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