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RESEARCH ARTICLE

Cloud Based Framework for Road Accident Analysis

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Abstract— Analysis of road accident is very important in a developing country. This projects aims at designing a cloud based framework for analysing road accident. The reason for accidents are because of various factors like road conditions, vehicle conditions, human driving conditions, weather conditions, experience of drivers and nature of traffic. It is highly possible that these accidents occur due to lack of knowledge of driver regarding specific conditions of road. It is important because in natural disasters, timely detection and communication of this information could reduce the amount of loss.

Keywords— Cloud Computing; Road Accident Analysis; Traffic control; Data mining; SAAS

I. INTRODUCTION

The project aims at providing a framework through which road accident and its related information are stored for prediction and decision making. The entire work is focussed on deploying the road accident relevant data on cloud considering the service characteristics of cloud. The data is huge, as it comes from different regions at different points of time. From this large set of data, implicit extraction of useful information is done by data mining. This framework will identify locations with high accident risks by means of data mining and provide valuable information to government towards traffic safety.

II. RELATED WORK

Today, all vehicles are fitted with equipment's such as GPS, vehicle tracking system for various reasons. In order to monitor road traffic the authors in [1] proposed a traffic control system based on Wireless sensor network (WSN). A mobile vehicle system named ParkNet was developed by [2]. They used GPS device to get good accuracy and real time parking statistics. The authors presented the use of fourth generation wireless technology in cars and its concepts. The authors in [3] presented a survey for platform as a service with some applications in an interactive environment such as a car. The following papers have been studied for development of a framework in cloud. The key areas include Data mining approach for extracting meaningful information from large datasets, Cloud computing for

storage and computation of this big data, cluster based computing for performing analysis. This cluster computing is done using Spark environment. Table 1 show the work carried out in this field till date

Table 1: Literature Review

Author	Approach	Merits	Limitations	Comments
Cloud computing and Accident Handling Systems. *Jabar H Yousif*et al. 2013 [4]	Provide solutions for life critical system using the concepts of cloud computing.	The development of a car system improves driver safety and raises their relaxation.	For real time protection, we must deploy smart devices and sensors inside every road vehicle. Collecting raw information is difficult.	Information from vehicle will be analysed using data mining or soft computing and results will be given back to the user.
Architecture Of Traffic Control Systems Using Cloud Computing. *V Brizgalow et al, 2010* [5]	Fast improvement in information technology allows development in accident handling system. Developed an architecture where some parts can be presented as cloud computing.	Involves multiple cloud components which communicate among each other. Proposed a cloud architecture with five layers. It includes client layer, IaaS, SaaS, PaaS, Server layer.	-	Illustrated data storage on cloud.
A Survey on Open-source Cloud Computing Solutions, *PatríciaTakako Endo* et al,	Comparative board of the open source cloud solutions in terms of the service type such as IaaS, PaaS, and SaaS, their main characteristics, and the infrastructure technologies. Explains about the various challenges in cloud and how open source cloud solutions help in the standardization efforts	Solutions are provided in the fields of infrastructure virtualization, usingIaaS for Cloud Computing focusing mainly on scientific applications, academic research, web mining applications, remote access over the Internet, virtual machine administration, storage and network.	In spite of the developments, there is still a need for standardization of current cloud platforms at least in terms of interface, negotiation and access through Web services.	-
[3]	The analysis of Big Data involves multiple distinct phases such as • Data Acquisition and Recording • Information	Big Data analysis now drives nearly every aspect of our modern society, including mobile services, retail, manufacturing, financial services,	The challenges include issues of scale, heterogeneity, lack of structure, error-handling, privacy, timeliness, provenance, and visualization, at all stages of the analysis	The challenges will require transformative solutions, and will not be addressed naturally by the next generation

	Extraction and Cleaning • Data Integration, Aggregation, and Representation • Query Processing, Data Modeling, and Analysis Interpretation	life sciences, and physical sciences.	pipeline from data acquisition to result interpretation.	of industrial products. We must support and encourage fundamental research towards addressing the technical challenges if we are to achieve the promised benefits of Big Data.
Vishal Jain and Mahesh Kumar Madan, 2011 [1]	Usage of data mining process, OLAP with the combination of multi agent system to find the knowledge from data in cloud computing.	As data is enormous that human cannot process it fast enough to get the information out of it at the right time Data Mining helps in fetching information from a data set and transform it into an understandable structure for further use.	Quality of data, interoperability.	For extracting Information from Big Data is Difficult, Data mining can be used for extracting data or information from a database which is not explicitly defined by the database.
Cluster computing with working sets, *Matei Zaharia* et al. May 2010 [7]	New model of cluster computing in which data-parallel computations are executed on clusters which provide fault tolerance and load balancing. This new model supports application that cannot be expressed efficiently as acyclic data flows	Identified the deficiency in Map-Reduce programming model. • Iterative Jobs • Interactive Analytics	Failure of a node in the cluster, it slowed down the job by 21 percent. The recovery time was high. It depends on the file system block size. Abstractions are limited-Three data abstractions: Resilient distributed datasets and two restricted types of shared variables.	Parallel operations are similar to Map-Reduce model. Being a fault tolerant and scalable system, it is very useful in applications where querying from big datasets requires time.

An efficient fault tolerant Model for Stream processing on large clusters, *Matei Zaharia* et al. 2012 [8]	Distribute applications over clusters. Nodes receive each record, update internal state, and send out new records in response. This is to develop a cluster computing model which raises several challenges • Fault Tolerence • Consistency • Unification with batch processing.	A system processed 40 MB per Second per Node. The system scales nearly to 50 nodes. Parallel computing caused only one second of extra latency. Recovery was faster.	Scaling is not perfect because there were more stragglers with more nodes. Any interval within the next 30s after a failure can exhibit a slowdown.	The paper presents a discretized streams (D-Streams), a stream programming model for large clusters that provides consistency, efficient fault recovery.

III. CLOUD COMPUTING IN ROAD ACCIDENT ANALYSIS

Cloud computing in accident analysis is needed for fast and timely computation of resources such as storage, processing and communication while handling the accident in parallel. Cloud computing framework provides many advantages for accident analysis. While handling road accident, many computations are involved. Cloud offers faster communication. Cloud offers quick processing ability and unlimited storage space to store this big data. Cloud is a centre for storage and application services.

A. Classification of Cloud

Cloud computing can be classified as public cloud, private cloud and hybrid cloud.

Public Clouds: Public clouds are also known as 'shared clouds'. A public cloud is where computer services such as applications or storage are made available to end users over internet. The advantage of using public cloud is that data stored can be accessed instantly from anywhere at any time. This type of cloud is managed by cloud service provider. A public cloud can be easily scaled to our needs. Public clouds are very transparent. They are needed by police department to minimise the accident occurrences.

Fig. 1 Public Cloud

Private Clouds: In the case of case of private clouds, the services are not provided to public by a service provider, but the services are maintained on a private network. It is also known as 'internal cloud' or an 'enterprise cloud'. This type of cloud provides security. Here, users have much control over the infrastructure of cloud and choose what software and hardware is

used. These are used by companies which require utmost security over stored data. The insurance companies who want to pay their customers, who met with accidents, have particular infrastructure and control over applications.

Fig. 2 Private Cloud

Hybrid Clouds: These type of clouds are helpful to supplement private cloud with the resources provided by public cloud. It is useful for those who want to utilize the functions of both public and private clouds. This type of cloud is suitable for companies who need to keep their data secure(private) and also communicate with customers(public)

Fig. 3 Hybrid Clouds

B. Services offered by cloud

The cloud service provider's offers services in three categories. The police department will be interested in finding out the vehicle which met in an accident. This service is used for running applications on demand. The services of different sectors like inside cars, can be managed in a single software that runs in cloud.

- *Software as a Service - SaaS*: This service is used for running application on demand. The service of different sectors like inside cars, can be managed in a single software that runs in cloud.
- *Platform as a Service - PaaS*: This service covers a layer of software and presents a service that can be used for constructing higher services. PaaS can be thought of a as a creator or client of service. This is similar to a API application and provides encapsulated service to all clients.
- *Infrastructure as a Service - PaaS*: IaaS is the medium of transmission of data on to the cloud storage. IaaS provides high performance computing applications like servers, switches and routers.

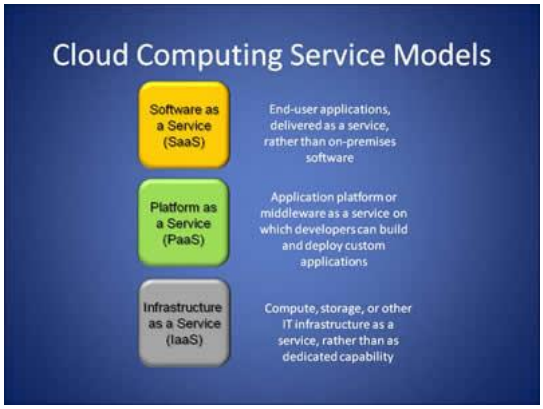

Fig. 4 Service models in cloud computing

IV. PROPOSED SYSTEM

In order to gather information regarding the problem detected and cause of accident, an on board system is installed. This device is a GPS unit which is used to collect information such as location of vehicle, speed. The information comes from different regions at different points of time. These data collected over years will be large and hence constitutes as big data. This information is then transmitted through several access point servers for storage on cloud and this project mainly aims at deployment of this data set on cloud. The layer of cloud – IaaS can be coupled with management of services of OS and application support. The information such as driver details are then analysed in cloud making use of PaaS that provides all facilities which supports decision making. This analysis helps to arrive at conclusions through data mining technique which will be useful for road users, hospitals, traffic monitoring department. The integration of analysed information is done with the help of SaaS characteristics of cloud which is majorly focussed on precautionary measures at the service level. The analysed data can be used to caution drivers about the accident prone areas, send emergency alerts to hospitals when an accident occurs.

The above mentioned processes are related to cloud services as follows:

- In the car level, we have GPS and other sensors to gather information. This is implemented in the HaaS layer of cloud.
- Transmission and communication is implemented in the IaaS layer of cloud. This is a medium for sending and receiving information.
- Processing jobs related to car, driver, weather and relevant information are analysed and processed in PaaS. This phase is to implement data analysis using data mining algorithms and to produce extract useful information from it.
- In SaaS, data received are analysed and send back important decision to increase road safety. It gives driver information about roads, and reduce accident risk. The analysis focus on crash avoidance and help drivers to be more cautious.

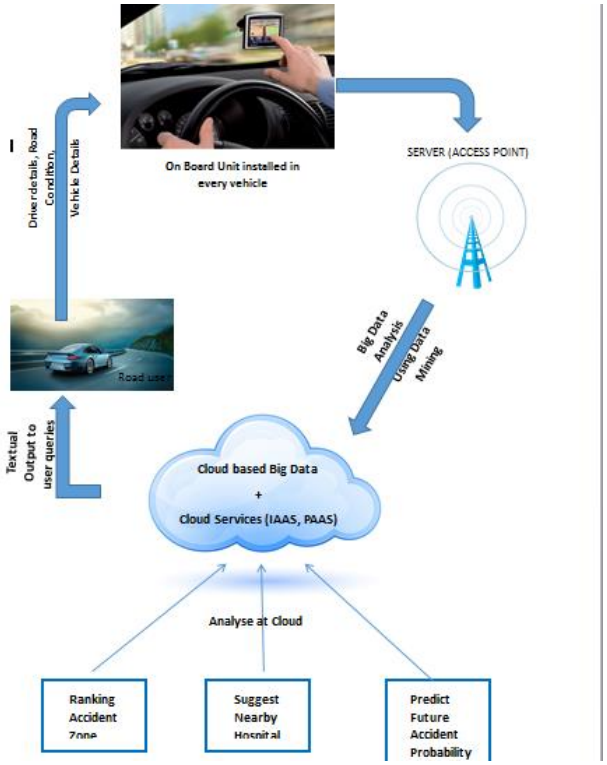

Fig. 5 Proposed Framework

V. CONCLUSION

In this paper, we aim at improving the efficiency of road accident handling using cloud computing. The paper describes the necessity of developing accident handling systems and the services that are required to support the system. The literature survey of the paper provides an overview of the research that has happened in the area of accident handling and cloud computing. Cloud computing proves to be highly efficient because of high storage capacity, efficient and quick processing ability, faster communication and the ability to support the system with a larger number of software applications. Cloud solutions are simple to acquire and are scalable. Hence they offer best service to the vehicles, road users and the hospitals in handling accidents.

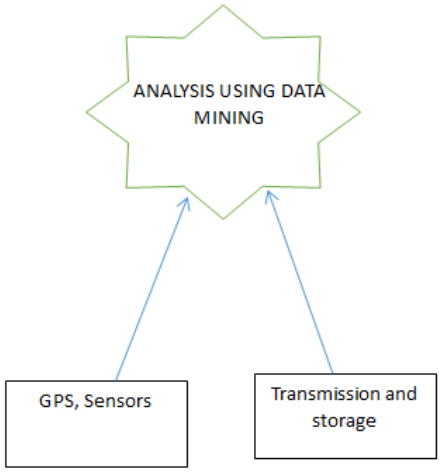

Fig. 6 Analysis of data

VI. DISCUSSION AND FUTURE WORK

We have found the necessary tools to build this framework. The programming of Hadoop framework and Pig interface has been done. A sample data set has been loaded to HBase and queries have been executed. We plan to focus on loading the original dataset of the required region. The analysis of data can be done using parallel K-Means algorithm. This resultant framework will be able to answer user queries related to road accidents in that particular region.

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REFERENCES

[1] Dinesh Kumar Saini and Jabar H Yousif, "*Soft Computing Techniques for Mishaps Prediction*", *International Journal of Computer Applications*, June 2012

[2] Ayala Daniel, "*Parking slot assignment games", ACM Sigspatial International Conference on advances in geographic information system*, pp. 299–308, Nov. 2011.

[3] ACA Research, Software-as-a-Service (SaaS) in Australia: Is it the Next Big thing? (2007) ,http :// www.anthonywatson. net. Au /files /SAAS%20White%20Paper%20FINAL.PDF (cited March 4, 2008) Bundit Wonglikphai, Project Management inEnterprise Resource Planning (ERP) Implementation, http://www.umsl.edu/~sauterv/analysis/f06Papers/Wonglip hai.
Ron Stence, "*Hybrid vehicle control system, Portable Design",* ISSN 1086-1300, vol.12, pp. 28-39. May 2006

[4] Jabar H Yousif, et al, "*Cloud Computing and Accident Handling systems",International Jounral of Computer Applications.* vol.63- No.19, Feb 2013.

[5] Brizgalov, Chukhantsev,Fedorkin, "*Architecture of traffic control systems using cloud computing*" 10 International Conferences and Seminar EDM 2010, July ERAGOL pp215-216

[6] Patricia Takako Endo, et al, "*A survey on Open-Source cloud computing solutions", V!!! Workshop on clouds. 2010*.

[7] Zaharia, Matei, Mosharaf Chowdhury, Michael J. Franklin, Scott Shenker, and Ion Stoica. "*Spark: cluster computing with working sets.*" In Proceedings of the 2nd USENIX conference on Hot topics in cloud computing, pp. 10-10. 2010.

[8] Zaharia, Matei, Tathagata Das, Haoyuan Li, Scott Shenker, and Ion Stoica. "*Discretized streams: an efficient and fault-tolerant model for stream processing on large clusters.*" In Proceedings of the 4th USENIX conference on Hot Topics in Cloud Ccomputing, pp. 10-10. USENIX Association, 2012.

