A Survey on Service Provisioning In Vehicular Cloud Architecture

[1]Devhuti Vyas, [2]Prof. Gayatri Pandi
[1]M.E. Student, [2]Professor
Computer Engineering Department,
L.J College of Eng. & Tech., Ahmedabad, India

***Abstract*— Cloud computing is a type of Internet-based computing that provides shared computer processing resources. Cloud computing is a network access model that aims to transparently and ubiquitously share a large number of computing resources. In future high-end vehicles are expected to under-utilize the on-board computation, communication, and storage resources. VANET will become World's largest ad-hoc network. In the literature, there is no solid architecture for cloud computing from VANET standpoint. In this paper, we put forth the taxonomy of VANET based cloud computing. It is, to the best of our knowledge, the first effort to define VANET Cloud architecture. Additionally we divide VANET clouds into three architectural frame works named Vehicular Clouds (VC), Vehicles using Clouds (VuC), and Hybrid Vehicular Clouds (HVC).**

***Index Terms*—Cloud Computing, VANET Cloud Architecture, Road Side Units**

I. INTRODUCTION

Vehicles belonging to a Vehicular Ad hoc Network (VANET) can form an ad hoc vehicular cloud in order to provide and to share services between the vehicles. Cloud computing is a type of Internet-based computing that provides shared computer processing resources. In future high-end vehicles are expected to under-utilize the on-board computation, communication, and storage resources. VANET will become World's largest ad-hoc network. In VANET, Vehicles and RSUs (Road-Side Units), i.e. network nodes, will be equipped with on-board computation and communication modules to make sure fruitful communication possible among them.

The available services in a vehicular cloud are divided into two main categories: (1) Infrastructure as a Service (IaaS) that describes the available physical resources and (2) Software as a Service (SaaS) that describes VANET adapted applications such as infotainment or traffic and comfort driving applications.

Vehicular Ad hoc Network (VANET) is a kind of Mobile Ad hoc Network formed by mobile vehicles, also known by mobile nodes. These vehicles are equipped with a WLAN technology that permits the establishment of a wireless ad hoc communication between the vehicles in the network Vehicle-to-vehicle (V2V) communication, or the establishment of a wireless ad hoc communication with stationary gateways, known by Road Side Units (RSU), implanted in the network Vehicle-to-Infrastructure (V2I) communication.

A VCC is composed from service requestor mobile or stationary vehicles that search for available services. The vehicles that are willing to provide services are known as service providers mobile or stationary vehicles.

II. Related Work

[1] In first paper, author proposed The basic idea of VANET is to take the widely adopted and inexpensive Wireless Local Area Network technology and install it on vehicles.

VANET Clouds Taxonomy using this paper divide VANET clouds into three major architectures namely Vehicular Clouds (VC), Vehicles using Clouds (VuC), and Hybrid Clouds (HC).

VC is further divided into two scenarios from movement standpoint. Static clouds refer to the stationary vehicles providing cloud services. IaaS and data storages services are feasible for such arrangements.

On the other hand, dynamic clouds are formed on demand in ad hoc manner. VuC connects the VANET to traditional clouds where VANET users can use cloud services on the move such as infotainment, traffic information, and CAA..

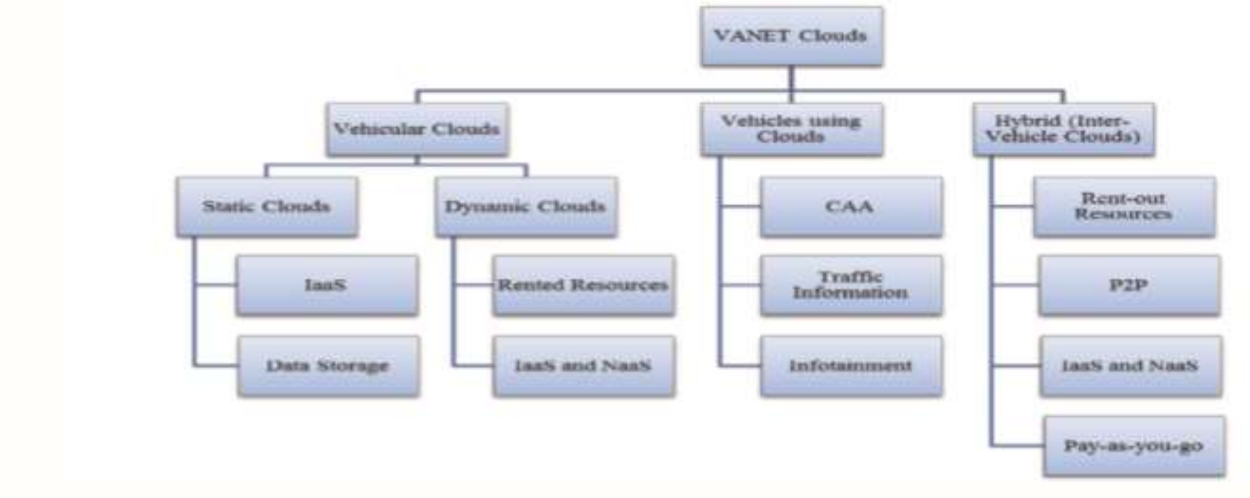

Fig. 1 Taxonomy of VANET Clouds [1]

Vehicular Clouds (VC):

The main players in VC include VANET infrastructure itself, gateways, and brokers as that the vehicular nodes serve as service providers in this paradigm. VC is formed in the following manner. First, the vehicles initiate a protocol to select broker(s) among them and identify the boundaries of the clouds following by electing an Authorized Entity (AE) among the brokers to ask for authorization in order to form a cloud. After brokers and AE are elected, then AE invites the vehicular nodes in the premises of the cloud boundary to take cloud Note that the job in hand can be handed over to the cloud by higher authorities in exchange of some incentives to the participants. AE dissolves the cloud after the job is done. The most appropriate example for dynamic clouds is dynamic traffic lights scheduling. But also the effect of changing one traffic light would affect many others thereby demanding re-scheduling the traffic lights on a large scale. In the aforementioned scenario, AE sends the traffic signals rescheduling plan to the municipality and hence the traffic jams issues can be resolved in a timely manner.

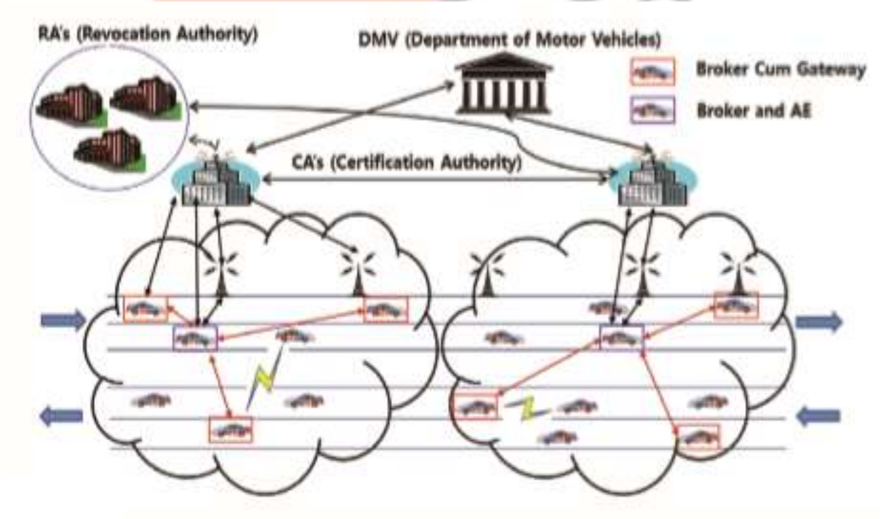

Fig. 2. Vehicular Clouds (VC) [1]

[2] In second paper, author proposed cloud computing functionalities vehicular cloud computing model called VANET-Cloud is proposed in this article. This model extends the conventional cloud infrastructure, which consists only of stationary nodes to the edge of vehicles. This extension is achieved by integrating new computing resources installed on vehicles.

As a result of VANET Cloud helps vehicular drivers to access computing resources using both mobile and stationary nodes in a virtualized manner with reduced costs.

VANET-CLOUD SUB-MODELS OF THE CLOUD LAYER:-

Permanent and temporary VANET-Clouds together constitute the proposed VANET-Cloud model as perceived by the client. The interconnection between permanent and temporary VANET-Clouds is enabled by a network consisting of all data centers of both VANET-Clouds. The provider is responsible for managing and controlling the merged network using different network techniques and protocols.

For example, Temporary VANET Cloud can access the permanent VANET Cloud, and in the permanent VANET Cloud can establish a connection with temporary VANET Cloud nodes leading to a global network controlled by the service provider.

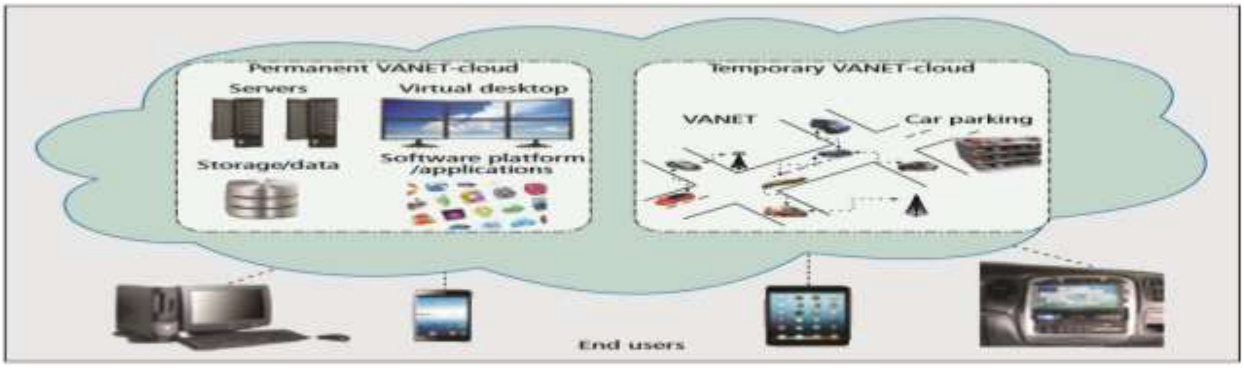

Fig.3.VANET-Cloud sub-models [2]

[3] In third paper, author proposed Cloud computing and Vehicular Communications are realization of smart cities. Mobile cloud computing and vehicular cloud computing forms the basis for both mobile cloud and vehicular cloud paradigms.

Cloud computing serves as an umbrella to define a category of on-demand computing services offered by commercial providers, such as Microsoft, Amazon, and Google. The main objective of the cloud is to offer computing, infrastructure, and storage, as a service.

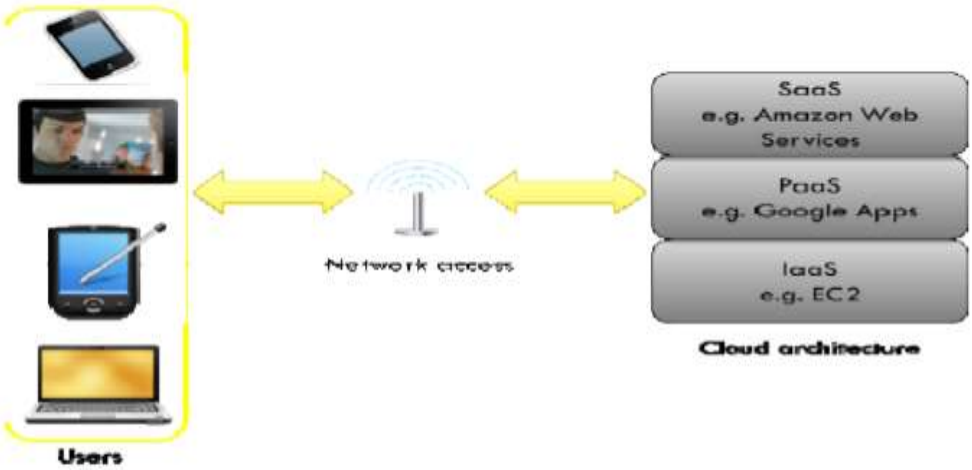

Fig.4: Mobile cloud computing [3]

[4] In fourth paper, author proposed a framework for rapid message dissemination that combines the advantages of diverse communication and cloud computing technologies. And also proposed a novel Cloud-assisted Message Downlink dissemination Scheme (CMDS), with which the safety messages in the cloud server are first delivered to the suitable mobile gateways on relevant roads with the help of cloud computing and then being disseminated among neighboring vehicles via vehicle-to vehicle communication.

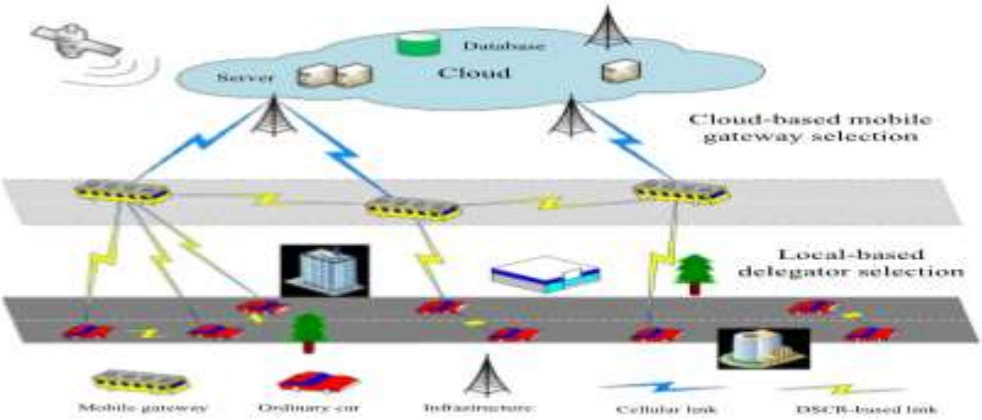

Fig.5. Architecture of cloud-assisted VANET–cellular heterogeneous wireless networks.[4]

low-tier nodes are the ordinary vehicles, which collect instantaneous traffic information and broadcast it to the local area only by using IEEE802.11p protocols. high-tier nodes are the distributed cloud servers, which can provide timely traffic information and suitable traffic guidance.

Mid-tier nodes, namely, gateway service providers (GPs), are the buses that provide Internet accessing service and exchange information between the Internet and the neighboring vehicles.

[5] In fifth paper, the proposed solution is based on studying its performance in terms of service delivery ratio. We consider that the quality of service is high when the service delivery ratio exceeds 70%.

The simulation results indicate two different results for two different strategies. The first series of simulations are realized in a simplistic manner, without taking into consideration the mobility of the vehicles.

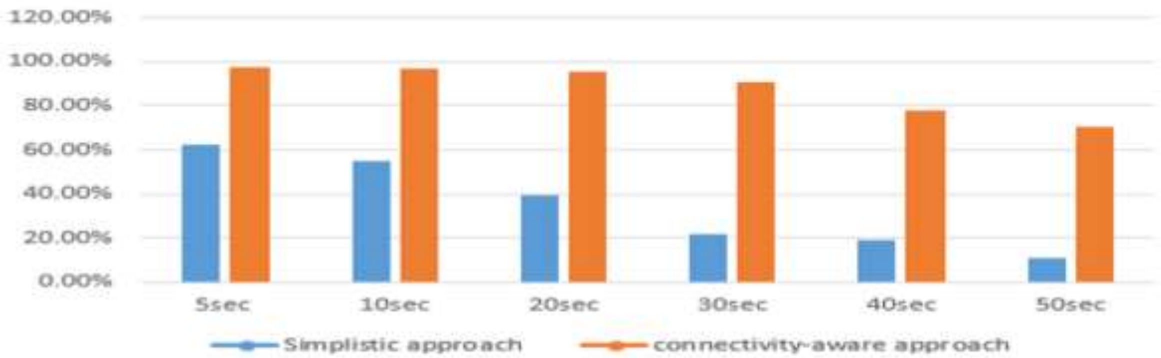

Fig.6.: Service Delivery Ratio[5]

The results show that the service delivery ratio did not exceed 10.83% for 50 seconds of service. However, the results of the second series of simulations are improved and we targeted 70.53% of service delivery ratio for 50 seconds of service.

The data aggregated in this scenario are text, photos and videos. This means that when the number of aggregated data is high, the overall decision taken may be more accurate reflecting the real situation. However, when it comes to computation, network or storage services, it becomes mandatory to reach a high service delivery ratio.

III. Conclusion

Vehicular Cloud allows a vehicle to request a set of data, such as photos, videos and text information, as a service. Thus, a vehicular cloud is formed to disseminate the request and aggregate the requested data. In our proposed mechanism, a vehicle may be potential to join the cloud, if it can provide the requested service and can communicate directly with the service consumer vehicle.

IV. REFERENCES

[1] Rasheed Hussain∗, Junggab Son∗, Hasoo Eun∗, Sangjin Kim† and Heekuck Oh∗ “Rethinking Vehicular Communications: Merging VANET with Cloud Computing”,978-1-4673-4510-1/12/$31.00 ©2012 IEEE

[2] SALIM BITAM, ABDELHAMID MELLOUK, AND SHERALI ZEADALLY, “VANET-CLOUD: A GENERIC CLOUD COMPUTING MODEL FOR VEHICULAR AD HOC NETWORKS”, 1536-1284/15/$25.00 © 2015 IEEE

[3] Moayad Aloqaily, Burak Kantarci¥, and Hussein T. Mouftah, “Vehicular Clouds: State of the Art, Challenges and Future Directions”, 978-1-4799-7431-3/15/$31.00 ©2015 IEEE

[4] Bingyi Liu, Dongyao Jia, Jianping Wang, Kejie Lu, Senior Member, IEEE, and Libing Wu “Cloud-Assisted Safety Message Dissemination in VANET–Cellular Heterogeneous Wireless Network ”, 1932-8184 © 2015 IEEE

[5] Rayane El Sibaï, Talar Atéchian, Jacques Bou Abdo, Jacques Demerjian, Rami Tawil “A new software-based service provision approach for Vehicular Cloud ”, 978-1-4673-6587-1/15/$31.00 ©2015 IEEE