Journal of **N**onlinear **A**nalysis and **O**ptimization
Vol. 14, Issue. 01 : 2023
ISSN : **1906-9685**

A COMPUTING FRAMEWORK AND EFFICIENT RESOURCE ALLOCATION FOR AUTOMOTIVE MULTIMEDIA CLOUD COMPUTING BASED ON DYNAMIC PRIORITY

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ABSTRACT
In an intelligent transportation system, smart vehicles are fitted with a range of sensing devices that offer a range of multimedia services and applications related to smart driving assistance, weather forecasting, traffic congestion information, road safety alarms, and a range of entertainment and comfort-related applications. These smart cars produce a huge amount of multimedia-related data that demands quick and real-time processing but can't be efficiently handled by independent onboard computer equipment due to their limited computational power and storage capacity. To accommodate such multimedia applications and services, the underlying networking and computer infrastructures have to be modified. Recently, the integration of vehicles with cloud computing has come to light as a solution to a number of problems with processing multimedia content (such as resource cost, rapid service response time, and quality of experience) have a significant impact on vehicular communication performance. To address the aforementioned issues, we present an effective resource allocation and computation architecture for vehicular multimedia cloud computing in this research. Using the Clouds simulator, the proposed scheme's performance is assessed in terms of quality of experience, serviceresponse time, and resource cost.

INTRODUCTION

High-speed Internet is becoming a prerequisite for autonomous or driverless vehicles, which the automotive sector is focusing on globally in collaboration with academics. These smart cars can take high-resolution pictures, record movies, and understand a huge quantity of sensory data, as shown in Figure 1, to ensure a successful and smooth voyage as well as to enjoy a range of multimedia applications and services from comfort to entertainment [3]. Also, through a roadside infrastructure, smart vehicles may interact and share a variety of information with one another, including pictures of road maps, information on road safety, and traffic load data for safe driving. Also, these cars may exchange a range of additional data (for example, automatic parking, map position, Internet connection, cooperative cruise control and driving, security distance and collision alerts, driver assistance, and road information broadcast) [1] [2]). As a result, cars generate a large amount of vital andtime-sensitive data, which necessitates on-time processing to assure on-time delivery and preserve the quality of the experience. However, because to the limited storage and computational capabilities of isolatedonboard devices, such a large volume of multimedia-related data cannot be processed. Furthermore, intermittent connectivity, short radio communication,lack of bandwidth, and high mobility can make the task more challenging.

Figure.1: Vehicle equipped with real-timeand multimedia applications for efficient and smooth driving

RELATED WORK

Vehicular cloud networks: Challenges,architectures, and future directions:
Vehicular Cloud Computing is a promising solution to exploit the underutilized vehicular resources and to meet therequirements of VANET applications and services. Although modern vehicles have important capacities of computation and storage, there is an increasing need for resources, in particular, for safety applications which require the cooperation between vehicles. The vehicular cloud offersto users the opportunity to rent resources on- demand or to share them freely to run their applications or to carry out some tasks. Even though this paradigm is feasible, itsimplementation still faces problems. Many researchers have focused on the architectural design in order to overcome different challenges and consequently meet user requirements to provide him/ her with reliable services. In this work, we survey the vehicular cloud paradigm. We focus on its features and architectures. We first present a brief overview of the motivation of vehicular cloud. Then, we explore challenges related to its design. Furthermore, we highlight the features of existing vehicular cloud architectures: we provide a taxonomy of vehicular cloud followed by our classification criteria. Finally, we discuss issues that can beconsidered as open research directions.

Internet of vehicles: From intelligent grid to autonomous cars and vehicular clouds:
Traditionally, the vehicle has been the extension of the man's ambulatory system, docile to the driver's commands. Recent advances in communications, controls and embedded systems have changed this model, paving the way to the Intelligent Vehicle Grid. The car is now a formidable sensor platform, absorbing information from the environment (and from other cars) andfeeding it to drivers and infrastructure to assist in safe navigation, pollution control and traffic management. The next step in this evolution is just around the corner: the Internet of Autonomous Vehicles. Pioneered by the Google car, the Internet of Vehicles will be a distributed transport fabric capable to make its own decisions about driving customers to their destinations. Like other important instantiations of the Internet of Things (e.g., the smart building), the Internet of Vehicles will have communications, storage, intelligence, and learning capabilities to anticipate the customers' intentions. The concept that will help transition to the Internet of Vehicles is the Vehicular Cloud, the equivalent of Internet cloud for vehicles, providing all the services required by the autonomous vehicles. In this article, we discuss the evolution from Intelligent Vehicle Grid to Autonomous, Internet-connected Vehicles, and Vehicular Cloud.

IMS cloud computing architecture for high- quality multimedia applications:
A novel IP Multimedia Subsystem (IMS) framework with cloud computing architecture is proposed for use in high quality multimedia applications. The IMS supports heterogeneous networking with Quality-of-Service (QS) policy. Map Reduce analysis is also used to enhance cloud computing capability. This architecture enables users to access high- quality multimedia applications via Android-based appliances. In this study, the

IMS QS policies of three wireless access technologies, 3G, WiFi and WiMAX, are integrated in a cloud computing environment to provide different services such as VoIP services and video streaming services. Experimental results indicate that the proposed mechanism improves system performance by allocating resources according to service priority. The proposed architecture also significantly improves system capacity to accommodate numerous users.

FRAMEWORK

Now-a-days all latest vehicles are equipped with sensors to monitor road condition, traffic condition, entertainment and manage many other details require at the time of driving and this monitoring services make vehicles as smart vehicles. Smart vehicles monitoring devices accept input from sensors and take decision and this devices runs on battery and may not sufficient to process road side videos and images to take on time decision and to reduce this burden from devices cloud computing or mobile computing features added to devices. Devicewill take input from sensors and then offloadtask (videos and images) to mobile cloudcomputing (MCC contains high resources data centers which run on internet) and MCC will accept request and then process request and then send response back to vehicle and based on response vehicle may take decision.

Existing MCC may not allocate resources efficiently which can cause delay in response and due to delay in response vehicle may not take decision on time and accidents may happen. For example if accident happen at road number 10 with vehicle 0 and there could be traffic jam and vehicle 0 may send current situation details to MCC and MCC has to report to other vehicles about accident and traffic jam at road number 10 and if MCC delayed in sending reports to other vehicles so therecould be many more accidents or heavy traffic jam.

To avoid above problem author suggesting Dynamic Priority Based Resource Allocation for vehicle Cloud Computing andin propose work resources will be allocated to incoming request dynamically based on priority. Due to dynamic priority based resource allocation request will be assigned to suitable data centers which can process request faster and can send response with shorter delay.

In propose work if request is with high priority then HIGH resources and FREE data center will be chosen.

Propose work consists of three components

1. VMCC (Vehicle Mobile Cloud Computing) Architecture: This architecture consists of Request UNIT (RU) which accept request and send to Load Manager (LM) andthen Load Manager assigned request to COMPUTING CLUSTERING UNIT (CCU). This CCU is further divided into 4 sub clusters such as Conversion cluster, Extraction Cluster, Matching and Reconstruct Cluster.
   a. Conversion Cluster:Conversion cluster evaluate load on each data center
   b. Extraction Cluster: Extractioncluster extract available free data centers
   c. Matching Cluster: Matchingcluster assigned best matching data center to request
   d. Reconstruct Cluster: This layer built object of best matching center
   e. MVCC Job queue model: This layer manages requests of queues
2. Dynamic Resource Allocation: This component help matching cluster to allocate resources dynamically toeach incoming queue request.

In this paper author is comparing above propose work with existing Single data center technique where each request will be handled by single data center and in propose work request will be handled by free data centers based on priority. In this paper author is using CLOUDSIM simulator to evaluate performance of both propose and existing work.

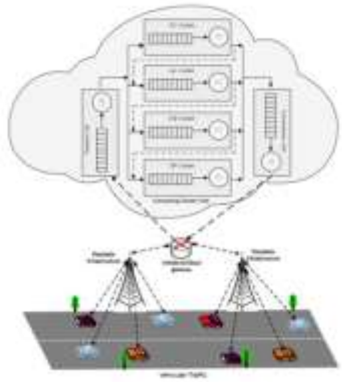

Figure.2: System model

ALGORITHM:

Algorithm 1: Priority-based Task Scheduling and Processing Procedure

input : Global channel set N
output: Sorted Set of available channel K
Initialize request queue with $R_Q \leftarrow$ null
Assign collection time C_t with initial value α_t; $C_t \leftarrow \alpha_t$
Collect requests from vehicles till the expiry of α_t
LM analyzes the R_Q to estimate the total workload N
for $n_i \leftarrow 1$ **to** N **do**
  /* Sort n_i based on priority value */
LM assigns computing resource χ_{α_t} to each computing cluster CC based on the value of total workload N
$DCC \leftarrow \chi_{\alpha_t}$
$DEC \leftarrow \chi_{\alpha_t}$
$DMC \leftarrow \chi_{\alpha_t}$
$DRC \leftarrow \chi_{\alpha_t}$
for $I \leftarrow 1$ **to** N **do**
  /* LM sends multimedia task I into the priority queue P_Q of its appropriate CC */
for $J \leftarrow 1$ **to** N **do**
  /* CC processes the multimedia task J */
  if J *wants further processing step* **then**
    Add J into the P_Q of next CC
  else
    Add J into the P_Q^T of TU
for $K \leftarrow 1$ **to** P_Q^T **do**
  /* TU transmits processed multimedia task K to its intended vehicle(s) */

Priority scheduling is a non-preemptivealgorithm and one of the most common scheduling algorithms in batch systems. Each process is assigned first arrival time (less arrival time process first) if twoprocesses have same arrival time, then compare to priorities (highest process first). Also, if two processes have same priority then compare to process number (less process number first). This process is repeated while all process get executed.

EXPERIMENTAL RESULTS

In this paper author is using CLOUDSIM simulator to evaluate performance of both propose and existing work. In CLOUDSIM we modified Priority Based Scheduler according to login of existing and propose work and same simulation we can run inexisting and propose work by enteringoption as 0 or 1. If we enter option as 0 then clouds run in existing single data center allocation and if we enter option as 1 then clouds will run in propose dynamicallocation scheme.

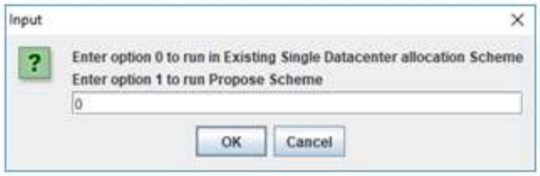

Figure.3: Input entering screen

Figure.4: Home screen

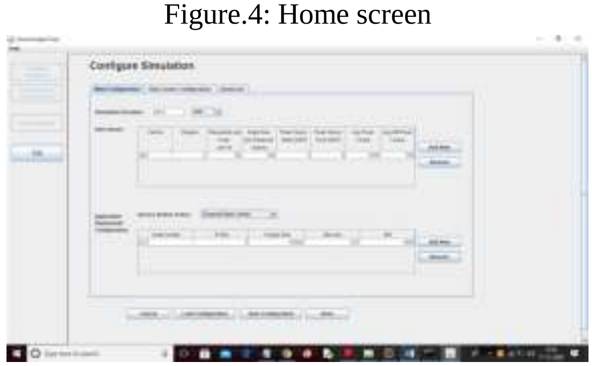

Figure.5: Simulation screen

Figure.6: Data center configuration

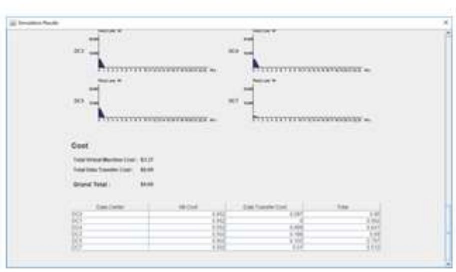

Figure.7: Overall response summary

CONCLUSION

To solve the difficulties of fast reaction time, guaranteed quality of experience, and low computing cost, we suggested a dynamic priority-based efficient resource allocation and computing architecture for cars in this work. Multimedia jobs are separated into four sub-tasks in oursuggested method and assigned to a specialized computing cluster for processing. A priority non-preemptive queue is used to ensure that distinct vehicular multimedia jobs with varied priorities receive on-time responses. Furthermore, the computational resources in our proposed approach are dynamically updated based on load statistics. In terms of QoE, resource cost, and reaction time, the suggested systemis tested using Clouds simulator with static resource allocation scheme and baseline single cluster-based computing scheme. The suggested approach outperforms the baseline single cluster-based computing and static resource allocation strategy, according to simulation findings.

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