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AN AUTOMOTIVE MULTIMEDIA CLOUD COMPUTING SYSTEM BASED ON DYNAMIC PRIORITY FOR EFFICIENT RESOURCE ALLOCATION IN AUTOMOTIVE MULTIMEDIA

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ABSTRACT
Smart cars are equipped with a variety of sensing devices that provide a variety of multimedia services and applications related to smart driving assistance, weather forecasting, traffic congestion information, road safety alarms, and a variety of entertainment and comfort-related applications. These smart automobiles generate a massive quantity of multimedia-related data that has to be processed quickly and in real time, but independent onboard computer equipment cannot effectively manage this data due to its limited computing and storage capabilities. It is necessary to make changes to the underlying networking and computer infrastructures in order to support such multimedia apps and services. As a recent solution to a variety of issues with processing multimedia material (such as resource cost, quick service response times, and quality of experience), the integration of automobiles with cloud computing has been brought to light. These issues have a substantial influence on the performance of vehicular communication. In this study, we provide an efficient resource allocation and processing architecture for vehicle multimedia cloud computing to overcome the aforementioned problems. The performance of the suggested scheme is evaluated using the Clouds simulator in terms of user experience quality, service response 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. As illustrated in Figure 1, these smart automobiles can record videos, capture high-resolution photos, and comprehend a vast amount of sensory data. This allows them to assure a successful and smooth journey as well as take use of a variety of multimedia apps and services for comfort and enjoyment [3]. Additionally, smart vehicles may communicate and exchange a range of information with one another via a roadside infrastructure, including images of road maps, statistics on traffic loads for safe driving, and information on road safety. A variety of other data may also be exchanged between these vehicles (such as automated parking, map location, Internet connection, cooperative cruise control, collision alarms, driver assistance, and road information broadcast) [1] [2].

As a result, automobiles produce a lot of important and time-sensitive data, which calls for prompt processing in order to guarantee delivery on time and maintain experience quality. However, such a huge amount of multimedia-related data cannot be handled due to the constrained storage and computing capabilities of isolated onboard equipment. Additionally, the work may be made more difficult by sporadic connectivity, brief radio communication, a shortage of bandwidth, and rapid mobility.

Figure.1: A vehicle with real-time and multimedia apps for effective and comfortable driving

RELATED WORK

A promising approach to using underutilized vehicle resources and satisfying the needs of VANET applications and services is vehicular cloud computing. Despite the significant computing and storage capabilities of current cars, there is a growing need for resources, particularly for safety applications that call for vehicle cooperation. Users have the option to rent resources on-demand or to freely share them in the vehicular cloud in order to execute their apps or complete certain activities. This paradigm is workable, however there are still issues with its application. Numerous studies have concentrated on architectural design in an effort to address a variety of issues and ultimately satisfy customer needs in order to deliver trustworthy services.

We examine the vehicular cloud concept in this paper. We concentrate on its structures and characteristics. We begin by giving a succinct summary of the driving force behind vehicular cloud. Then, we look at problems with its design. In addition, we emphasise the characteristics of current vehicular cloud designs by presenting a taxonomy of vehicular clouds and our categorization standards. Finally, we talk about topics that represent potential future study areas.

The car has typically been the man's extension of his ambulatory system, submissive to the driver's orders. This concept has been altered by recent developments in communications, controls, and embedded systems, opening the door to the Intelligent Vehicle Grid. The automobile is now a powerful sensor platform that gathers data from the environment (and from other vehicles) and feeds it to infrastructure and drivers to help with traffic management, pollution control, and safe navigation.

The Internet of Autonomous Vehicles will be the next development in this process. The Internet of Vehicles, which will be a distributed transportation fabric capable of making its own judgements about taking passengers to their destinations, was pioneered by the Google automobile. The Internet of Vehicles will feature communication, storage, intelligence, and learning capabilities to anticipate the intentions of the consumers, just as other significant instantiations of the Internet of Things (such as the smart building). The Vehicular Cloud, which serves as the autonomous cars' go-to Internet cloud, is a concept that will facilitate the transition to the Internet of cars. In this essay, we go through how autonomous, internet-connected vehicles and the vehicular cloud evolved from the intelligent vehicle grid.

For usage in high-quality multimedia applications, a unique IP Multimedia Subsystem (IMS) framework with cloud computing architecture is suggested. Heterogeneous networking is supported by the IMS's Quality-of-Service (QS) policy. Enhancing the capabilities of cloud computing also uses Map Reduce analysis. Through this design, customers may utilise Android-based appliances to access premium multimedia apps. In this work, the 3G, WiFi, and WiMAX IMS QS policies of three wireless access technologies are combined in a cloud computing environment to deliver various applications including VoIP and video streaming. According to experimental findings, the suggested approach boosts system performance by allocating resources in accordance with service priority. The proposed architectural so significantly improves system capacity to accommodate numeroususers.

FRAMEWORK

Today's newest cars come with sensors to track road conditions, traffic conditions, entertainment, and many other details needed while driving, and these monitoring services turn cars into smart cars. Smart car monitoring systems gather data from sensors and make decisions. These systems run on batteries and may not be able to process roadside videos and images in time to make decisions and to lessen the load on the devices' cloud computing or mobile computing characteristics. Device will receive input from sensors, offload the task (videos and photos) to mobile cloud computing (MCC), which has high-resource datacenters that operate online, and MCC will accept the request, process the request, and then deliver the result back to the vehicle. Based on the response, the vehicle may then make a choice.

Due to inefficient resource allocation, which might cause delays in responses, accidents may occur. As a result, decisions made by vehicles may not be made promptly.

For instance, if a collision occurs on Road Number 10 with Vehicle 0, there may be a traffic jam, and Vehicle 0 may communicate information about the current situation to MCC and MC.C has to report to other vehicles about accident and traffic jam at road number10 and if MCC delayed

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

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 CLOUDS IM simulator to evaluate performance of both propose and existing work.

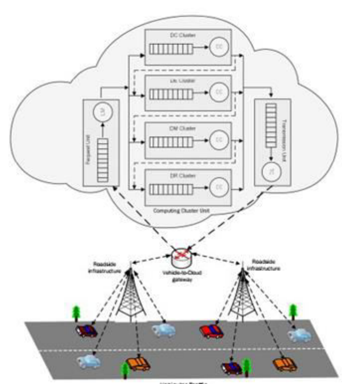

Figure.2: System model

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) */

One of the most popular scheduling methods in batch systems is priority scheduling, a non-preemptive technique. If two processes arrive at the same time, the process with the lower arrival time is given priority; otherwise, the process with the greatest priority is given priority. Additionally, compare the process numbers (the one with the lowest priority first) if two processes have the same priority. While every step is being carried out, this one is repeated.

EXPERIMENTAL RESULTS

In this paper author is using CLOUD SIM simulator to evaluate performance of both propose and existing work. In CLOUD SIM we modified Priority Based Scheduler according to login of existing and propose work and same simulation we can run in existing and propose work by entering option 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 dynamic allocation scheme.

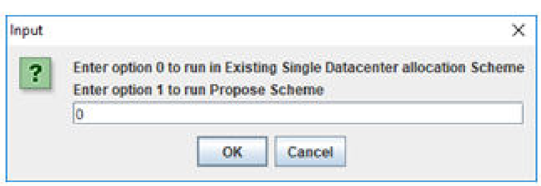

Figure.3:Input entering screen

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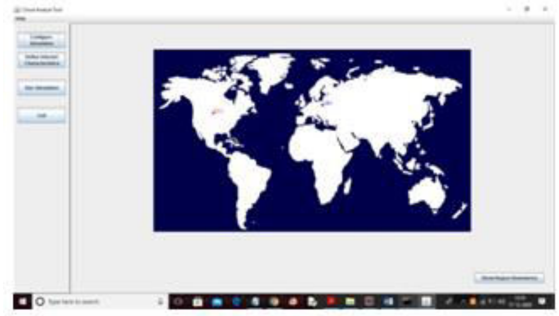

Figure.4:Home screen

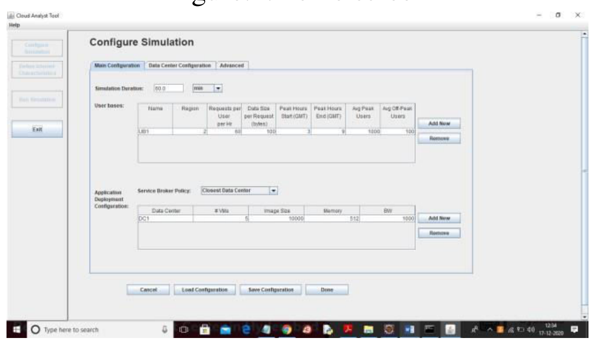

Figure.5:Simulation screen

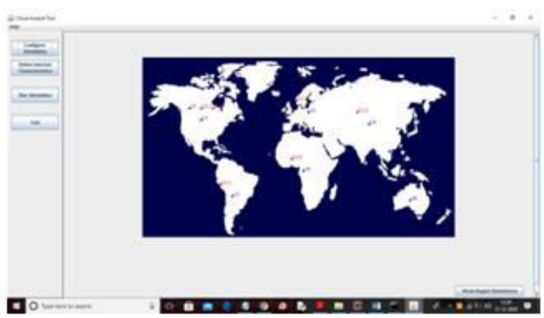

Figure.6:Data center configuration

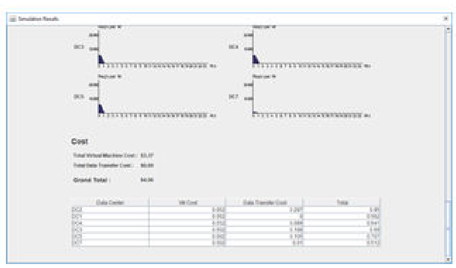

Figure.7: Overall response summary

CONCLUSION

In this work, we proposed a dynamic priority-based efficient resource allocation and computing architecture for vehicles to address the challenges of quick reaction time, assured quality of experience, and cheap processing cost. In our proposed approach, multimedia workloads are divided into four sub-tasks and allocated to a specialized computer cluster for processing. To guarantee that various vehicular multimedia jobs with different priorities receive timely answers, a priority non-preemptive queue is employed. Additionally, depending on load

measurements, the computing resources in our suggested solution are dynamically updated.
The recommended system is tested using the Clouds simulator with a static resource allocation scheme and a baseline single cluster-based computing scheme in terms of QoE, resource cost, and response time. Simulation results show that the proposed method outperforms the baseline single cluster-based computing and static resource allocation technique.

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