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Novel Approach for Service and Channel Selection with QoS Parameters using Optimization Techniques in Large Networking Environment

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***Abstract*— The proliferation of wireless access points is a modern phenomenon. As a vehicle-speed mobile user traverses a heterogeneous wireless network, service continuity is often achieved via the use of handover mechanisms. Users on the go expect to be able to connect to wireless networks whenever and wherever they like. Given the wide variety of wireless access technologies already present, it is assumed that users and applications will always be linked to the one that best suits their needs. Even more difficult is ensuring a smooth transition from one network to another, as is required during a vertical handover. The proposed work provides an overview of vertical handover methods and proposes an algorithm, the Context-Aware Vehicular Handover Algorithm, that employs the Genetic Algorithm (GA) optimization technique to prioritise available wireless networks based on a user's preferences, the requirements of the currently active application, and the surrounding environment. Based on user preferences and application needs, this method is designed to pick the optimal potential network for meeting connection requirements.**

Keywords—Analytic Hierarchy Process, Gray Relational Analysis, Media independent handover, Gray Relational Analysis

I. INTRODUCTION

In Recent years, research is done rapidly and effectively in area of mobile computing. After long research in adhoc networking and mobile computing Mobility of node is still challenge in front of researchers. A mobile ad hoc network consists of two things one is mobile hosts or node and another one is wireless communication. The mobility of devices or host, the topology of the network always changes and that change is not uniform. It is unpredictable when a node will move, and wireless connections often fail and reconnect. In an ad hoc network, each node is responsible for coordinating its own participation in the flow of data since the network itself is not in place to do so. Wireless communication between moving cars is a common example of a mobile ad hoc network. Cars in this system have a radio modem that is controlled by a computer and can communicate with other vehicles in the area. The term "Vehicular Ad hoc Network" describes this group of networks (VANET). According to our research, the most promising uses for inter-vehicle communication are in the areas of driver convenience and security. Broadcasting is a core function in these networks since most safety applications rely on sharing information among connected cars; yet, the critical nature of the information transferred in safety applications necessitates a high level of confidence in the delivery of broadcast messages.

The maximum 30% of all accidents are occurs due near crossroads according to [1] and [2], making it imperative that broadcasts in these areas be very reliable. At intersections, however, the communication range of a vehicle on one road may overlap with some vehicles on another road, and so the broadcasting of vehicles on one road can affect the broadcasting of vehicles on another road, which, according to current broadcast mechanisms, cancels broadcast in some directions. In this study, we provide evidence of this issue and provide a broadcast approach that gets around it. We distinguish between cars on roads that intersect in the suggested technique by categorizing them based on their distance from the previous forwarder of message. This allows us to avoid the potentially disastrous side effects of cross-roads broadcasting. The remainder of this paper is organized as follows. Section 2 Need of Broadcasting VANET; section 3 Problems faced at intersection and Related work Next Section is proposed method; the last section concludes this paper.

I. NEED OF BROADCASTING IN VANET

Simple flooding is a common method used in the field of broadcasting. Any node that receives a broadcast message will instantly rebroadcast that message. In terms of data dissemination speed, this method may be quite effective. Not only is it easy, but it also doesn't need knowing anything about your neighbours. On the other hand, its performance suffers in both highly populated and sparse environments. Simple flooding may generate high collision, resulting in poor dependability with many unnecessary broadcast messages, which is especially problematic in busy areas like traffic jams during rush hours. Additionally, the route request (RREQ) mechanism of AODV in a WSN setting has been discovered to suffer from the same issue. In dispersed areas, such as roads at night, automobiles travel quickly and may not have another neighbour within their range of transmission. In a network without any other nodes to relay messages to, even a massive flood has no effect. The control channel is used by the WSN's safety mechanisms to facilitate the exchange of safety-related information between cars (C2C communication) and between vehicles and infrastructure (C2I communication).

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Blend of the wired and wireless network is eminent and used in various kinds of applications. Further, wireless networks have turn out to be trendy since last decade. Nowadays, Reinforcement learning techniques are preferred for channel selection in 5G network to provide QoS to users. Lots of research is still going on channel selection using various techniques. Thus, reinforcement learning is considered to train the network for selecting best channels for communication out of available channels.

This work focusses on designing and development of model considering QoS to select one of the best channels in a 5G network. A Reinforcement Learning (RL) based channel selection mechanism is considered. This technique helps algorithm to learns itself and provides the best channel to user based on a variety of QoS parameters. QoS refers to the network capability to provide superior service to users. In general, various facets of the network service such as packet loss, throughput and availability are considered to quantitatively measure QoS. Thus, it is the ability to offer various precedence to several applications, users, or data flows. It guarantees a definite network performance to a data. Transferring data from one user to another user needs a physical medium, called as communication channels. Thus, channel is used to convey data among users. In general, wired and wireless medium is available for communication. This learning method interacts with its environment that produces actions and finds either error / rewards. Trial & error search as well as delayed reward are the pertinent attributes of reinforcement learning. It helps network providers to provide best channel from the available channels with the help of QoS parameters for commission. It also helps to maximize network performance. This system is able to recommend the best channel within available channels with the help of reinforcement learning technique.

II. PPROBLEM AT THE INTERSECTION

Because the communication range of a vehicle on one road may extend to vehicles on another road, the broadcasting of vehicles on one road can affect the broadcasting of vehicles on another road and cancel their broadcasting, increasing the likelihood of broadcasting stop in some roads when there is an intersection in the path of the packet dissemination.

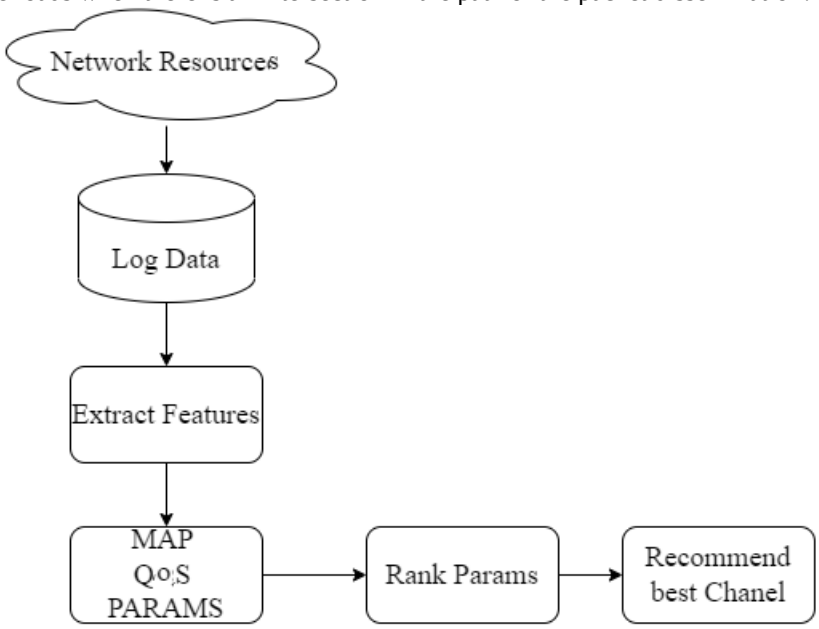

Figure 1 : Proposed system architecture

The intended audience in this diagram is the cars behind A. Vehicle A sends out a broadcast message, which is picked up by Vehicles B, C, and E, who then calculate a defer time depending on their distance to Vehicle A. Since vehicle B is the furthest receiver, it will have its defer time expire first and retransmit the message; following vehicle B's retransmission, vehicles C and E will receive duplicates and will cancel their retransmission to save bandwidth. When this happens on Route 1, transmission stops and messages cannot be transmitted to cars since there is no other node that has not received a duplicate and can be designated as relay (a vehicle in the hatched area).

B. *RELATED WORK BROADCASTING.*

Multicasting using software-defined networks (SDNs) in a simulated environment, using a collection of different cellular networks. Flexible multicast communication between nearby users was made possible by a Software-Defined Network (SDN)-based hybrid LTE/WLAN network architecture. The scientists analysed the delivery of multicast video frames to actual smartphones using the NS3 simulator, which simulated a heterogeneous network architecture. The authors can replicate a genuine LTE/WLAN network and transmit video packets to smartphones by connecting the testbed to a real-world video server. By sending video to linked devices through LTE and WLAN, we can ensure that our testbed is functioning properly. The multicast

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latency experienced by D2D users is decreased (thanks to their proximity to one another) as is the control overhead. When used properly, Heterogeneous Graph Nodes (HGNs) may drastically cut down on the amount of time it takes to execute a graph. When simulating the use of heterogeneous environments, Heterogeneous Graph Nodes (HGNs) are useful modelling tools. A streamlined form of graph nodes, HGNs are introduced here (CG). Directed acyclic networks are useful for modelling computational activities (CGs). Using joint power user scheduling, tiny cells may overlay the uplink spectrum of macrocells, and D2D-enabled multi-hop transmission can be utilised to boost signal reception at the cell edge so that more users can be served at once. Understanding how to integrate power allocation and user scheduling to maximise the ergodic sum rate for nearby users in small cells while still satisfying the needs of FUs and macro-cell users in terms of quality of service. When there are many users but few base stations, finding the optimal solution involves a time-consuming and laborious search through all conceivable combinations of SBS, NU, and FU (SBSs). The authors recommend breaking the original problem down into two components, power allocation and user scheduling, to make the solution more manageable.

Heterogeneous edge caching using collaborative devices [4]. Through the optimization of node selection and cache replacement in mobile networks, D2D-aided heterogeneous collaborative edge caching is established. Long-term mixed-integer linear programming is solved by the authors using a deep Q-learning network and a Markov decision procedure. Additionally, the authors created a model for attention-weighted federated deep reinforcement learning (AWFDRL), which makes use of federated learning to improve the efficiency of training Q-learning networks while reducing the amount of resources they need to do so. Effective Task Scheduling Across Many Devices in Distributed Computing [5] is a method for coordinating the execution of multiple tasks across multiple devices in a distributed computing environment. Data-parallel kernels benefit greatly from this approach when computation and data are evenly distributed, but it is less effective when analysis and data are not. To prevent underutilization of devices, uneven load distribution among devices, and the need for frequent kernel launches, inter-device data transfers, and synchronizations, a dynamic and elastic task scheduling solution based on asynchronous communication is proposed. In a battery of tests conducted on a hybrid CPU-GPU-MIC system using eight sample concurrent applications, the two inter-device task scheduling algorithms were found to successfully divide up the work amongst the devices. Connectivity between gadgets Keeping Things Connected with a Continuous Authentication Protocol for the Internet of Things [6]. Continuous authentication between devices protects against denial-of-service attacks with the use of shadow IDs and emergency keys. Additionally, it takes into account the freedom of sensors without compromising security. The authors used Scyther to analyse the safety and reliability of the suggested approach. The authors also ran the numbers to see how much more or less it cost to compute than the alternatives. Evidence is provided that the protocol is safe and that it has low computational costs.

Cognitive Agents Build Mobile and Pervasive Computing Services on the Fly [7]. As part of a cognitive paradigm, dynamic coordination of distributed services is achieved. method puts constrained rationality before of optimality, so it can adjust to scarce input and work within its constraints. When comparing the technique to existing service composition models with features of mobility, service density, and composition complexity, the results indicated that the method may be useful in MPC situations with limited resources. Using opportunistic networking and computing technologies, the authors of Services for Opportunistic Networks [8] were able to reduce the time it took to complete a project and increase its success rate. Towards an opportunistic network composition framework In this method, the execution time and success rate are used to calculate a utility function. The amount of time spent on creating service descriptions, request translations, and service matching might be reduced by leveraging available natural language, as suggested by Unrestricted Natural Language-based Service Composition using Sentence Embeddings [9]. There are service generation systems based on biological languages, however they only allow for syntactic/semantic service retrieval. The authors argue that the use of Sentence Embeddings to represent phrases pertaining to the description, matching, and recovery of services is warranted since it makes use of the most recent advancements in Machine Learning and Natural Language Processing. Model-Driven Middleware Integration for Distributed Simulations [10]. Integrating gaming and pub/sub middleware by using a model-driven strategy to address the semantic gap. Authors give straightforward examples to demonstrate the effectiveness and convenience of the presented method.

Heterogeneous IoT Service Discovery [11] is based on OCF. Using an Open Connectivity Foundation (OCF) standard as an example, the authors of a device area network service discovery framework explain how to address the issues that lead to heterogeneity at the IoT device layer. The CAMPIE Internet of Things platform includes this foundation. The CAMPIE middleware and cloud service may be linked to the device layer using this platform. Multi-Strategy One such system is the one described in the paper Dynamic Service Composition in Opportunistic Networks [12]. To deal with dropped connections, this composition system uses a platform that uses available resources for networking and computing as they become available. Services are generated on the fly, customised to each individual customer. OverCloud: Microservices-Based Internet of Things-Cloud Service Composition [13] is a composite service invocation framework that employs a multi-strategy architecture with a partial recovery mechanism. Dynamic To facilitate the development of MSA-based IoT-Cloud services on top of the preexisting multiple clouds, OverCloud is a specially built ultra-thin overlay layer. Once the idea has been developed, the writers build a software framework to produce it in real time. A software framework based on a process is also used when writers are involved. At long last, writers have created a superb IoT-Cloud solution with the necessary longevity. An Experimental Evaluation of Use Cases and Network Service Composition Beyond 5G [14] The effectiveness of hardware and software components of a versatile optical metro access network is measured in an experimental testbed. As part of its network infrastructure, the disclosed system makes use of an FPGA and adapted open-source network management and telemetry tools. FPGAs, which are similar to CPUs, may be configured to forward and monitor traffic while controlling optical devices in response to control plane input. The proposed

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network is able to provide capacity-adapted network slices for edge computing connections thanks to network service orchestration and SDN management. Network service chain (NSC) evolution and automatic bandwidth resource allocation.
Increasing the Quality of Service for Overnight IoT Devices Preparing for the future by stocking up [15]. Using a nonlinear programming approach known as bisection, the original problem is partitioned into two subproblems. To start, we may redistribute bandwidth. Likewise, determine the ideal possibility of sleeping well. To wrap up the analytical results, we provide the following from the simulations: The likelihood of napping is sensitive to changes in channel quality rather than the quality-of-service supply, and this sensitivity is inversely proportional to available bandwidth. Heterogeneous caching across distributed edge computing networks [16]. Over edge computing networks, the inventors of the collaborative D2D caching concept and D2D communication protocols design and address the effective-capacity optimization issue. Finally, the authors develop collaborative D2Dcache matching algorithms by using a bipartite network selection methodology to choose D2D-caching users. When subjected to the adaptive quality-of-service calculation for medical data processing [17], the suggested collaborative D2D caching solutions outperform current systems. A QoE and an AQCA are in the works. The quality-of-service evaluation for healthcare applications is conducted on large-screen user terminals with displays ranging from 4 to 10 inches in size (for example, LCD panel size, resolution, etc.). These gadgets are meant to provide reliable ECG service in an urgent situation, with features like high brightness and long battery life. These UT gadgets optimise power consumption, travel options, and battery life. There is an examination of how much variation in QoS parameters affects the handling of medical data. The findings of the experiments show that the physical, MAC, and network layers all have a role in determining the QoS. (optimal).
Thus, AQCA provides better quality-of-service computing than the Baseline does for healthcare-related uses. Improvements in service quality for medical edge computing [18]. optimising medical quality of service (m-QoS) in mobile edge computing-based healthcare by considering network parameters like PMR, Std. dev, delay, and jitter during an 8-minute medical video stream called "Navigation to the Uterine Horn, transection of the horn, and re-anastomosis' transmission over 5G networks. W-RCA, BSA, and Baseline are examined for their effectiveness in maximising m-QoS using an MPEG-4 encoder at either the source or server. For IoT Networks, a Safe and Reliable Method of Communicating Data Over the Internet [19]. safe communication with consideration for quality of service in IoT networks (QoS-IoT). Using this method, Sybil nodes and their fictitious identities may be isolated in a network with several communication hops. To ensure per-flow fairness and effective use of available bandwidth, a CW is selected when a Sybil node is identified. When the nodes create a lot of data, the MAC layer protocols struggle to keep up with the communication. The media access control (MAC) layer is unable to provide QoS for forwarding or priority traffic.

Using AI to improve IoV system QoS for multi-media communication [20]. In the first step, it evaluates the effectiveness of PQO and BQO in relation to the Baseline. Here are two more suggestions: In the third place, we present a QoE optimization framework for mobile multimedia communication in an IoV system. The suggested PQO and BQO algorithms not only extend the life of the mobile device by 25% and 27%, but they also increase the quality of the user's experience by 31% and 33%. When compared to the Baseline, these methods perform better and might be considered for use in IoV systems for multimedia communication. Picking the Right Access Points for 5G Internet of Things Networks with Varying QoS Needs [21]. Establishing node-specific QoS settings improves network scalability and access device selection. It's suggested that you try a hybrid WiFi/LiFi RAT network indoors. From what we can tell from our experiments, the suggested approach improves upon the performance of previous client-based access device selection algorithms by as much as 32.66% in network emulation and 50% in hardware testing. Complexity and game-theory-based convergence assessments, network emulation and hardware-based evaluations, and LiFi channel analysis are all contributions of this article. Analysis of interoperability between several types of IoT devices [22]. A comprehensive state-of-the-art assessment on CTC divides CTC methods into two categories, hardware-based and hardware-free, depending on the underlying technology they rely on. Certain equipment is needed to transmit data to wireless gadgets and enable direct interaction between them. However, hardware-free solutions allow for direct communication across heterogeneous wireless devices without the need for any specialised hardware. New techniques in CTC are discussed, and how they might be used to enable direct interaction between devices with different architectures in the wireless realm. Alternatively, the authors outline two unanswered questions for further study.
System for Indoor Localization using a Probabilistic Approach [23]. In a system with numerous surveyors and multiple clients, a crowdsourced fingerprint may be used to identify mobile users. When calibrating between several trainers, a linear regression model is used. A geometric distribution is used to determine the conditional probability of a client stumbling onto an access point that was hidden during training. The suggested system might provide equivalent results. In a real-world wireless network, an untrained device may be located with an average matching accuracy of 94% using an existing radio map. Computing in Dynamic Groups Using Multiple Devices (MASTA) [24]. An algorithm is always probing new gadgets and channels to gauge their efficiency before assigning them tasks. MABSTA's implementation of Gibbs Sampling, which uses trace data from a wireless IoT testbed, is computationally efficient and delivers competitive performance in many situations. Additionally, the authors illustrate the polynomial-time sampling strategy and show that MABSTA is 1-competitive in any dynamic environment without stationarity limitations compared to the best offline assignment. To our knowledge, MASTA is the first online learning algorithm developed specifically for this problem. Energy Efficient Clustering of Heterogeneous Devices was being rotated. New Energy-Efficient Clustering Method Based on Rotation.

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III. PROPOSED WORK.

In the proposed study, we first develop a VANET system that keeps track of the locations of all the nodes that have arrived at each junction.

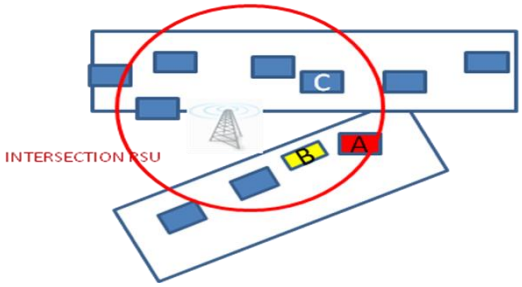

Figure 2. Proposed Intersection Road Side Unit

In Figure 2 shows the newly installed RSU (Road Side Unit) at the junction. This RSU will aid in counting the total number of cars approaching the junction and predicting the path of vehicles using a route prediction algorithm. All cars within range of this RSU will be alerted about the number of vehicles making a turn or continuing straight.

In this paper, we provide a more efficient scheduling approach for Ad-Hoc networks on vehicles (VANETS). Increased network throughput necessitates the use of such an algorithm. In comparison to the previously employed basic scheduling method, this one is more stable on a cluster with an increasing number of vehicles and has higher throughput capacity. Through the use of a simulation research, we were able to evaluate the algorithm's performance under several conditions, such as cluster density and vehicle velocity. Based on the simulation findings, it was shown that the mobility pattern strongly affects the algorithm's behaviour and the final outcomes..

Primary security requirements

It has been determined that entity authentication, message integrity, no repudiation, and privacy protection are the major security needs. To meet these stringent security standards, the PKI is the best method currently available. Certificate Revocation Lists (CRLs) are used in PKI to effectively handle revoked certificates. As a result of the CRL's anticipated size, the time it takes to determine whether or not a certificate in a received message has been revoked is likely to be considerable.

Efficient authentication

An effective authentication and revocation mechanism, named TACK, is proposed. TACK has a hierarchical system design with a single trusted authority at the top and decentralised regional authorities (RAs) across the network. The authors used a group signature scheme in which the reliable source managed the group and the cars participated as individuals. Each vehicle has to get a new certification when it enters a new area, and that certification can only be obtained from a certain RA.

Message Authentication

For the purpose of brevity, this article does not go into depth on the specifics of a TA signing a certificate or an OBU signing a message in order to adopt a generic PKI system. For now, we'll stick to discussing ways to speed up the certificate revocation list (CRL) check, which is the standard procedure for validating that a given certificate hasn't been revoked. For the purpose of verifying and authenticating messages between nodes in a network, they are signed and exchanged using a text data.

Resistance to Colluding Attacks

In a colluding attack, two OBUs work together to allow a revoked vehicle to pass the revocation check by using the current secret key Kg to calculate valid HMAC values for the transmitted messages. The HSM of an OBU is where all of the unit's security data is kept, hence it must be impregnation-proof. The new secret key Kg is also kept in the HSM, and it is never communicated in clear since all the key update activities in Algorithms 3-5 occur inside the HSM.

Authentication Delay

The binary CRL checking software does a binary search on a text file that contains the sorted identities of the revoked certificates, whereas the progressive CRL checking programme runs a search on a text file that contains the unsorted identities of the revoked certificates. Elliptic Curve Digital Signature Algorithm (ECDSA) is used to verify the sender's certificate and signature in the second and third authentication stages.

End-to-End Delay

To further assess EMAP, we ran a ns-2 simulation of the city street environment shown. The settings used in the simulation are described. To meet DSRC requirements, we've decided to have OBUs update drivers on road conditions every 300 milliseconds. In this model, TraNS is used to create the mobility traces that are used in the simulation. Which is why we have something called "end-to-end delay," or the time it takes for a communication to travel from the sender to the recipient. End-to-end latency in milliseconds (ms) vs the number of operational base station authentication protocols (EAPs).

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Message Loss Ratio

An OBU's average message loss ratio is calculated as the sum of the number of lost messages per 300 milliseconds (msec) caused by the message authentication delay divided by the number of milliseconds (msec) that the OBU receives messages. It is important to emphasise that our focus is only on the message loss experienced by OBUs as a result of V2V communications. Every 300 milliseconds (ms), each OBU is required to broadcast a message detailing the current road conditions in accordance with DSRC. Each OBU should check the messages it has received in the previous 300 msec before sending out a new message on the road state, ensuring an appropriate and instantaneous response to the altering road conditions. For this reason, we decided to assess the message loss ratio.

Results and Discussions

The algorithm was designed and evaluated in NS2. The simulations were carried out in diverse settings. Multiple sets of observations were documented. Number of packets delivered were observed against time, variable packet size and increase in number of contending nodes. Results show that algorithm outperforms in improving QoS parameters.

The proposed system implements Context aware GA optimization algorithm that selects network on the multi attribute decision making algorithm GA. Following is the analysis of the parameter performance used by this algorithm. Proposed system considered performance parameters such as throughput, packet loss, latency and cost. The proposed work is carried out with simulation tool NS Simulator version 2.35. In our experiment throughput have calculated. The throughput calculation has been using below formula

Throughput (bits/sec) = sum (number of successful packets) *(average packet_size))/Total Time sent in delivering that amount of data.

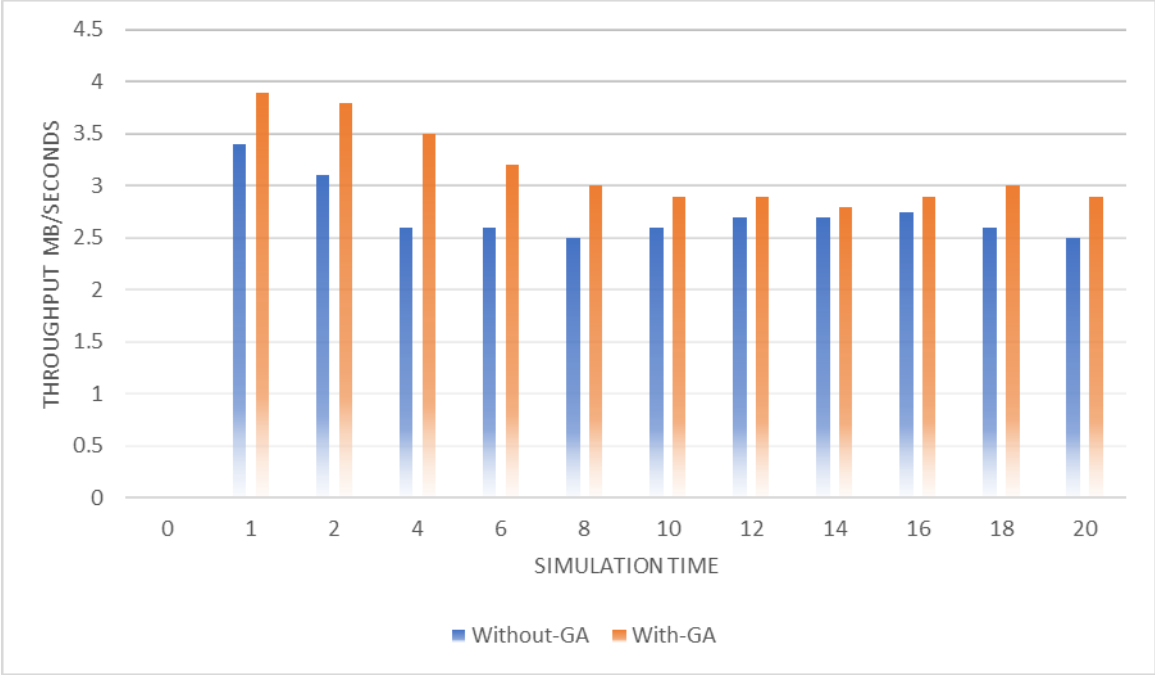

Figure 3: Throughput Comparison with and Without GA Algorithm vs Simulation time

CONCLUSION

With the introduction of EMAP for VANETs, the time-consuming CRL checking method may be replaced with a quick revocation checking process using the HMAC function, allowing for faster message authentication. An OBU may still update its compromised keys using the proposed EMAP's unique key sharing approach, even if it has missed some revocation notifications in the past. EMAP may be integrated with any PKI system because to its modular design. Furthermore, it outperforms authentication methods that use the traditional CRL and is resistant to typical assaults. Therefore, compared to traditional authentication techniques using CRL checking, EMAP may drastically reduce the message loss ratio caused by message verification latency. In the future, we want to work on speeding up the authentication of certificates and message signatures.

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