# Reputation - Based Oppurtunistic Routing Protocol Using Q-Learning For Manet Attacked By Malicious Nodess

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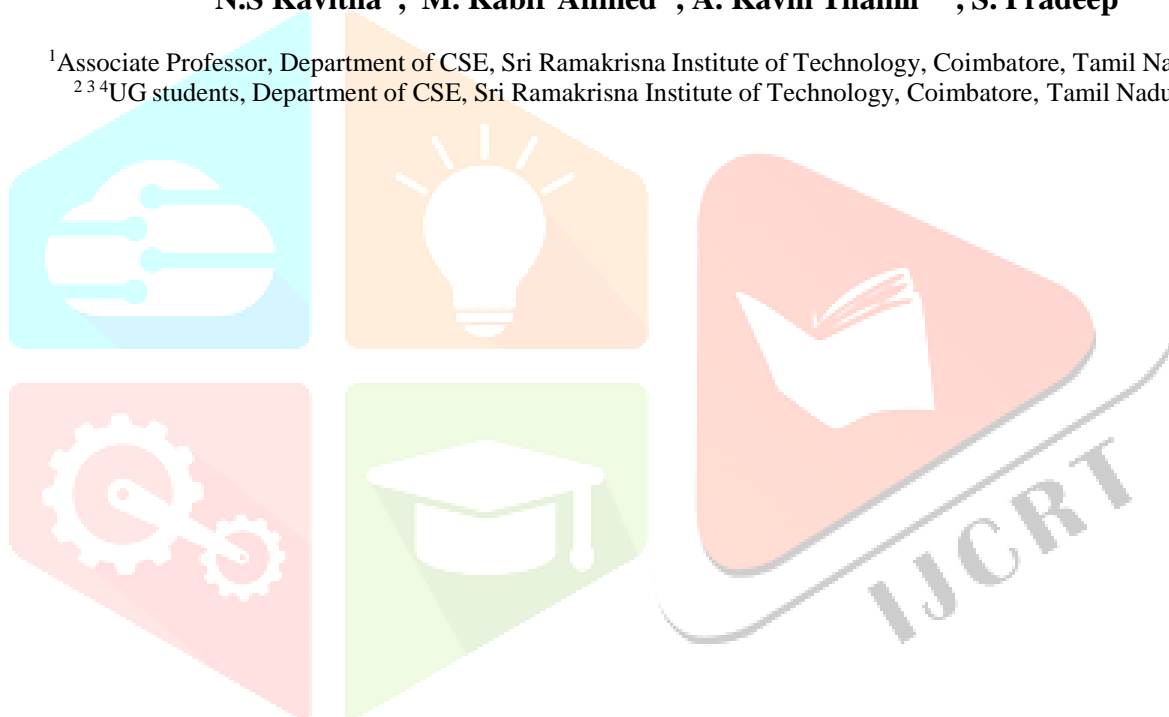
Abstract - In mobile ad-hoc networks manets efficient and reliable routing is a significant challenge due to dynamic topologies nodes mobility and the potential presence of malicious or uncooperative nodes this paper presents a reputation-based opportunities routing protocol using q-learning rorq a novel approach that combines reputation systems with reinforcement learning to enhance the routing decision-making process the protocol assigns reputation scores to nodes based on their past behavior such as successful packet forwarding or malicious activity and uses these scores to inform routing decisions each nodes learns optimal routing paths through q-learning where the state is defined by network conditions and nodes reputations and actions correspond to choosing routing paths the q-learning algorithm continuously updates the routing policy by maximizing the cumulative reward which is based on successful data delivery and nodes cooperation the proposed method dynamically adjusts to changing network conditions ensuring both the efficiency of data transmission and the trustworthiness of routes thereby mitigating the impact of unreliable or malicious nodes simulation results demonstrate that the rorq protocol improves packet delivery ratios reduces the impact of malicious nodes and enhances overall network performance compared to traditional routing protocols in manets

Key Terms: MANETs, RORQ, Routing, Q Learning, Reinforcement Learning

I. INTRODUCTION

This design addresses this pressing issue by using advanced ways from the fields of image forensics and deep mobile ad-hoc networks manets are a class of wireless networks where nodes generally mobile bias communicate with each other without the need for a fixed structure these networks are largely dynamic due to knot mobility bandwidth limitations and the frequent changes in network topology the lack of centralized control and the eventuality for nodes to parade vicious or selfish actions pose significant challenges in icing dependable communication and effective routing in manets this design addresses this pressing issue by using advanced ways from the fields of image forensics and deep mobile ad-hoc networks manets are a class of wireless networks where nodes generally mobile bias communicate with each other without the need for a fixed structure

In traditional manet routing protocols nodes make routing opinions grounded primarily on network topology or routing criteria similar as hop count detention or signal strength still these protocols do nt regard for the responsibility of nodes which is a pivotal factor in icing dependable packet delivery in the presence of vicious nodes that may drop or tamper with packets or uncooperative nodes that refuse to further packets traditional protocols come vulnerable to performance declination and security pitfalls.

One effective way to optimize routing opinions in similar dynamic surroundings is through underpinning literacy rl particularly q-literacy a model-free rl fashion q-literacy allows nodes to learn optimal conduct similar as opting a dependable path grounded on feedback from their terrain without taking previous knowledge by continuously streamlining a q-value table that represents the anticipated future price for each state-action brace nodes can acclimatize their routing opinions over time to maximize long-term performance.

II. SCOPE OF THE PROJECT

The Reputation-Based Opportunities Routing Protocol using Q-learning (RORQ) aims to address the challenges in Mobile Ad-Hoc Networks (MANETs) related to unreliable routing, malicious behaviors, and dynamic network conditions. This project's scope includes both the development and evaluation of a novel routing protocol that integrates reputation-based trust mechanisms with Q-learning to optimize the routing process in MANETs. The primary objective is to enhance the performance, reliability, and security of MANETs in environments where traditional routing protocols struggle.

Design a system where nodes maintain and exchange reputation scores based on their past behavior, such as successful packet forwarding or packet drops. Nodes will use this information to avoid unreliable or malicious nodes during the routing process.

III. EXISTING SYSTEM

Being routing protocols in mobile ad-hoc networks manets primarily concentrate on optimizing network performance through conventional styles similar as hop count end-to-end detention or signal strength popular protocols like ad hoc on-demand distance vector aodv dynamic source routing dsr and optimized link state routing olsr operate on the principle of swapping routing information between nodes grounded on the network topology these protocols still face significant challenges in dynamic and decentralized surroundings where nodes are mobile and the topology constantly changes one of the major limitations of these traditional protocols is the lack of mechanisms to regard for knot trustability and responsibility in the absence of similar mechanisms vicious or selfish nodes can disrupt the network by dropping packets.

It refuses to further data or tampering with routing information this can lead to increased packet loss degraded network performance and security vulnerabilities for

illustration in black- hole attacks a vicious knot can deceptively claim to have the shortest path to the destination thereby causing packet loss or route failures also in wormhole attacks vicious nodes can produce false routes that mislead the network causing packets to be diverted through unauthorized paths overall while being image authentication systems have made great progress there are still obstacles and limits that must be addressed to increase their effectiveness robustness and practical utility in a variety of fields continued exploration and development sweats are needed to progress the state- of- the- art in image forensics and authentication

IV. LITERATURE SURVEY

K. Zheng et.al [2021], proposes a new routing protocol qmcr for submarine wireless sensor networks in the internet of submarine goods iout rested on collaborative fashion and q- learning algorithm it introduces a price table designed for the submarine audial communication model allowing the agent to snappily and automatically opt the optimal transmission routing compared with other routing algorithms the proposed qmcr is shown to reduce the time consumption of the algorithm significantly while icing that the transmission energy of the named routing is roughly unchanged the document discusses the simulation and comparison with the effectiveness of the proposed qmcr in reducing time consumption while maintaining transmission energy it concludes by pressing the inflexibility of the proposed qmcr for different operations by adding new factors into the price function and suggests implicit unborn considerations for farther enhancement.

A. Rovira-Sugranes et.al [2021],discusses a proposed routing protocol that aims to minimize end- to- transmission energy by enabling nodes to make packet forwarding opinions grounded on original experience without taking previous information about network nodes mobility and business cargo distribution the proposed system completely- echoed q- routing with an adaptive learning rate using inferred parameters involves streamlining q- values grounded on estimated remaining time for packet delivery and using two literacy rates to ameliorate literacy speed the disquisition rate is controlled by the simulated annealing sa algorithm which starts with aggressive disquisition rates and gradationally leans toward more conservative opinions over time by cooling down the temperature parameter the document also describes a hierarchical modelling approach with conjugate priors for model parameters to grease inferring unrestricted- form posterior and prophetic chances for stir biographies of network nodes the literacy algorithm requires around fifty transmission rounds for full confluence which remains in the millisecond range

while the stir changes for network nodes do in the alternate range if not twinkles the algorithm is flexible enough to fete change points and re-adapt to new rapidity without mortal intervention.

X.Wang et.al [2019], discusses the significance of effective energy and bandwidth resource operation in mobile ad hoc networks manets pressing the limited and unrecoverable nature of knot coffers similar as power and bandwidth it introduces a pricing model for energy and bandwidth coffers emphasizing the need to consider factors similar as the quantum of energy used original energy of the knot and remaining bandwidth when calculating resource prices the conception of service pricing is introduced where nodes with advanced trust values and lower values are considered to have better service capabilities and a service price is equally commensurable to service capacity the document proposes a cost function design that takes into account the precedence of the current forwarding type of business overflows aiming to insure that flows with advanced precedence admit a advanced quality of service overall the document focuses on the need for effective resource operation introduces pricing models for energy and bandwidth coffers and discusses the conception of service pricing to insure advanced quality of service in manets.

J. F. Martínez-Ortega et.al [2018], discusses a routing algorithm for vehicular ad hoc networks vanets that takes into account parameters similar as signal- to- hindrance- plus- noise rate sinr and packet line length to elect relaying vehicles it introduces a weight- grounded approach using multi-attribute utility theory maut to calculate the mileage of vehicles with the friction of parameters serving as weights simulation results show that the proposed algorithm pro outperforms other algorithms in terms of packet delivery rate end- to- end detention and network outturn especially in thick network scripts the packet delivery rate and end- to- end detention in the pro algorithm are better than in other algorithms with the performance perfecting as the network viscosity increases albeit at a slower rate in thick networks the document highlights the impact of network viscosity on routing performance with meager networks being prone to partitioning and thick networks passing increased hindrance and competition affecting routing performance.

V.PROPOSED SYSTEM

The proposed system character- grounded openings routing protocol using q- literacy rorq aims to address the limitations of being manet routing protocols by integrating character- grounded trust mechanisms with q- literacy for adaptive and dynamic routing opinions the crucial invention of this system lies in its capability to combine

two critical factors knot character and underpinning literacy to enhance both the trustability and effectiveness of routing in manets rorq each knot maintains a character score that reflects its once geste in encouraging packets and sharing in routing opinions nodes with advanced character scores are considered more secure and are preferred for encouraging packets the character scores are streamlined periodically grounded on the success or failure of the packets.

They forward this trust- grounded approach mitigates the impact of selfish or vicious nodes similar as those that drop or modify packets by icing that only dependable nodes are named for routing paths the character system helps identify and avoid nodes that engage in vicious conditioning or are prone to failure therefore perfecting the overall network performance.

To stoutly acclimatize to changing network conditions q- literacy is incorporated into the routing decision- making process q- literacy a type of underpinning literacy enables each knot to continuously learn and modernize its routing strategy grounded on once relations and feedback the nodes learn optimal routing paths by assessing the state of the network eg knot reports link quality and knot mobility and opting conduct ie choosing the coming knot for encouraging packets that maximize their long- term price the price is grounded on successful packet delivery reduced detention and knot cooperation which encourages nodes to favor paths that have a advanced probability of success while avoiding those with unreliable nodes or advanced threat this combination of character- grounded routing and q- literacy enables rorq to acclimatize in real- time.

To network topology changes knot mobility and varying situations of knot cooperation the protocol is tone- optimizing meaning that over time nodes will meet on the most effective and dependable paths grounded on both the responsibility of bordering nodes and their own gests this adaptive approach not only improves the packet delivery rate and overall network outturn but also provides a strong defense against security attacks similar as black- hole wormhole and dos attacks as vicious nodes are gradationally barred from the routing process

In summary rorq offers a more robust result for routing in manets by integrating trust- grounded decision-making with underpinning literacy thereby icing both high security and effectiveness the proposed system improves the performance of manets by stoutly conforming to environmental changes handling vicious actions and optimizing data delivery across the network through simulations the systems effectiveness in enhancing trustability responsibility and network adaptability will be demonstrated furnishing a comprehensive result to the challenges faced by traditional routing protocols in dynamic and decentralized networks.

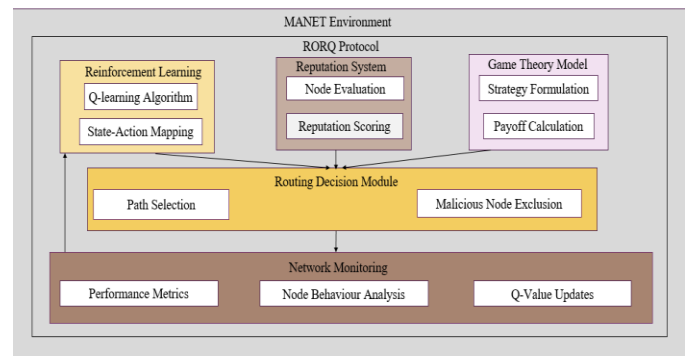## V. SYSTEM ARCHITECTURE

Figure 1: System architecture of the proposed system

In Figure 1, the image presents a high- position overview of a manet mobile ad hoc network terrain and the rorq character- grounded opportunistic routing protocol which leverages underpinning literacy character system routing decision module game theory model and network monitoring to enable flexible and effective data transmission in mobile ad- hoc networks the core factors include q learning algorithm path selection nodes evaluation vicious nodes exclusion strategy formulation payoff computation performance metrics nodes behavior analysis and q- value updates all working together to address the challenges posed by vicious nodes.

It optimize routing opinions in the manet terrain the proposed armature consists of multiple factors working collaboratively to optimize routing in manets the underpinning learning module utilizes q- literacy a model-free underpinning learning algorithm to make optimal routing opinions grounded on literal data it implements state- action mapping enabling the system to associate different network countries with optimal routing conduct stoutly this ensures adaptive literacy allowing the protocol to ameliorate routing performance over time.

The Reputation System establishes a trust-based mechanism to evaluate nodes behavior and assign reputation scores. Nodes Evaluation assesses the behavior of each nodes, monitoring compliance with routing rules, while Reputation Scoring quantifies the reliability of nodes, influencing path selection and the exclusion of unreliable nodes.

The routing decision module serves as the core unit of the protocol integrating inputs from reinforcement learning and reputation systems path selection prioritizes trustworthy and efficient routes ensuring optimal data transmission malicious nodes exclusion identifies and isolates nodes engaged in disruptive activities such as packet dropping or launching attacks the game theory model introduces strategic decision-making principles to encourage cooperation among nodes strategy formulation.

It develops incentive-based mechanisms to ensure rational nodes participation while payoff calculation determines the rewards and penalties associated with different routing strategies promoting honest behavior network monitoring continuously tracks network performance and nodes behaviors to refine routing decisionsPerformance Metrics analyze key parameters, including packet delivery ratio, latency, and throughput. Nodes Behavior Analysis detects deviations from expected actions, flagging potential threats. Q-Value Updates periodically adjust the reinforcement learning model based on real-time network conditions.

The RORQ Protocol integrates advanced techniques such as reinforcement learning, reputation-based routing, and game theory to create an adaptive and secure MANET routing mechanism. By continuously monitoring nodes behaviors and optimizing path selection, the proposed architecture effectively mitigates security threats posed by malicious nodes while improving network efficiency. Future research will focus on enhancing scalability and evaluating performance in real-world MANET scenarios.

RESULT AND ANALYSIS
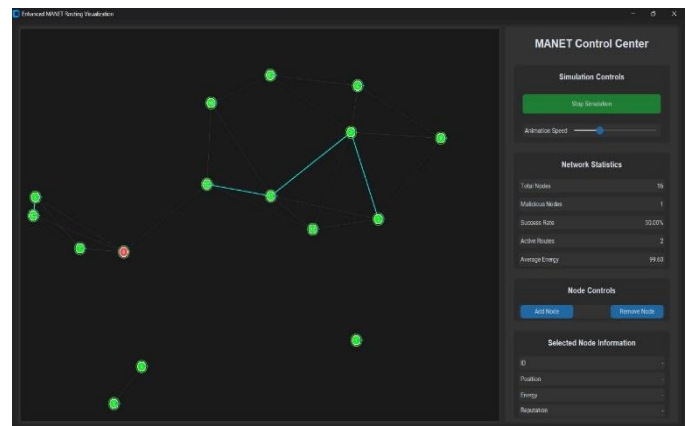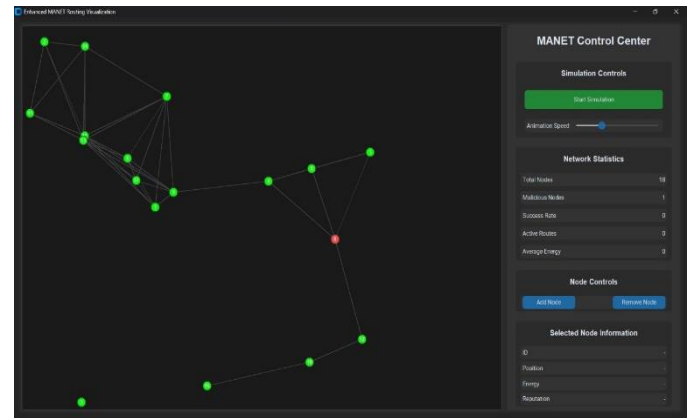
The provided image consists of three screenshots that demonstrate the simulation and evaluation of the reputation-based opportunistic routing using q-learning rorq protocol in a mobile ad-hoc network manet environment these screenshots include a visualization of the manet network real-time routing behavior and a performance comparison in terms of packet delivery ratio pdr between traditional protocols and the proposed protocol.

The first screenshot displays a manet simulation environment with nodes represented as green circles and a malicious nodes marked in red the control panel on the right labeled manet control center provides simulation controls network statistics and nodes management options the statistics section displays key metrics such as the total number of nodes the number of malicious nodes success rates active routes and average energy the visualization shows network topology with connected nodes indicating the communication links between them.

Packet Delivery Ratio (PDR)
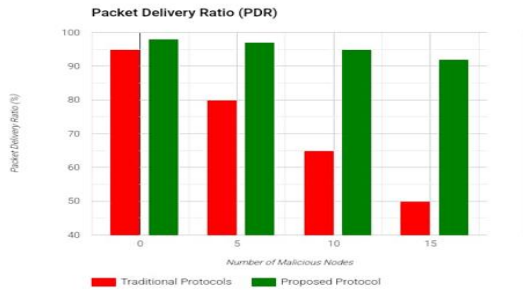
The alternate screenshot shows an streamlined network state where active routes are stressed in blue representing the paths named for data transmission the presence of a vicious bumps suggests that the proposed routing protocol is laboriously detecting and mollifying pitfalls by avoiding unreliable bumps while icing effective data forwarding the control panel remains analogous to the first screenshot but the statistics may have streamlined grounded on the simulation progress.

The third screenshot presents a bar map comparing the packet delivery rate pdr of traditional protocols depicted in red and the proposed rorq protocol depicted in green thex-axis represents the number of vicious bumps 0 5 10 and 15 while the y- axis indicates the pdr chance the map easily illustrates that the proposed protocol maintains a significantly advanced pdr indeed as the number of vicious bumps increases whereas traditional protocols witness a drastic decline in performance

These results illuminate the effectiveness of the proposed rorq protocol demonstrating its capability to maintain dependable data transmission in the presence of inimical bumps the integration of bolstering knowledge character- rested bumps evaluation and game proposition mechanisms ensures secure and optimized routing opinions overall the screenshots validate the protocols effectiveness in enhancing manet security perfecting packet delivery rates and mollifying the impact of vicious knot

VI. CONCLUSION

The character- grounded openings routing protocol using q- literacy ro- qrp provides a robust and innovative result to the challenges faced by traditional routing protocols in mobile ad- hoc networks manets by combining character- grounded trust operation with underpinning literacy q- literacy ro- qrp addresses crucial issues similar as security trustability effectiveness and rigidity in largely dynamic and decentralized surroundings the integration of character systems enables the discovery and mitigation of vicious or selfish nodes icing that only secure nodes are named for encouraging packets this significantly enhances the security of the network guarding it against common attacks like black- hole wormhole and denial- of- service dos attacks the system stoutly adapts to the ever- changing network topology and bumps actions by using q- literacy which optimizes routing opinions grounded on once gests and current network conditions this adaptive medium ensures that nodes continuously ameliorate their routing strategies leading to better packet delivery reduced detention and advanced network outturn.

The proposed protocol not only improves the effectiveness of packet delivery but also ensures that the resources analogous as bandwidth and energy are used optimally thereby perfecting network performance over time through continuous knowledge nodess are suitable to handpick the most reliable and effective routing paths icing that the network remains flexible and secure under various functional conditions in conclusion ro- qrp provides a comprehensive scalable and secure result for reliable routing in manets .This addressing the limitations of being systems by roundly conforming to network changes perfecting responsibility and high performance this approach offers a promising direction for future disquisition and development in the sphere of secure and adaptive routing in mobile and decentralized networks.

VII. REFERENCES

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