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Cost Optimal Approach using PSO in QOD Protocol for Hybrid Wireless Network

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Abstract: To support real-time transmission with rigorous Quality of Service (QoS) requirements for wireless applications, substantial research has been committed. At the same time, a wireless hybrid network which incorporates a wireless and MANET is better alternate for the next generation wireless networks. By verbatim acceptation of resource reservation-based QoS routing for MANETs, acquire invalid reservation and race condition issues in MANETs. To ensure the QoS in hybrid networks, QOD protocol has been enforced to provide prominent QoS performance. In this paper PSO based QoD protocol has been proposed, by using PSO (practical swarm optimization) algorithm for identifying the nearest neighbour. By using PSO the computational cost is diluted. Thus providing, an economic hybrid wireless network. By relying on an observation, the PSO based QOD protocol shows improved performance than QOD.

Keywords: QoS, QOD, Cost Optimization, PSO, Hybrid Wireless Network, MANET.

I.INTRODUCTION

The wireless network confronts a rapid development. It stimulates legion wireless applications that are used in wide areas such as Commerce Department, emergency helps, military, education, and entertainment. There is number of WiFi adequate to mobile devices letting in laptops and hand-held devices (e.g., smartphone and tablet PC) have been increasing rapidly. The number of wireless Internet users has tripled in quantity for the last 3 years in world wide. This shows the grandness of the communication throughout wireless network. The far-flung usage of wireless and mobile devices and the increasing necessitate for mobile multimedia system teeming services lead to a hybrid wireless network.

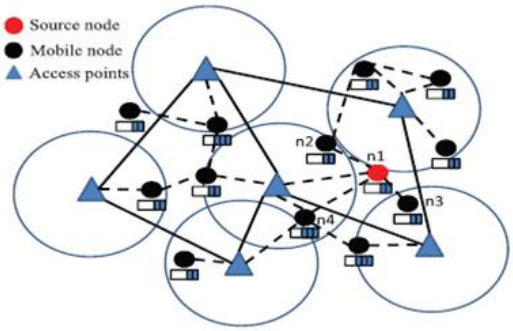

Fig 1. Architecture of Hybrid Network

Fig 1.2 shows the architecture of a hybrid network. For example, when a source node n1 needs to upload files to an Internet server through APs, it can opt to send out packets to the Aps straightaway by itself or require its neighbour nodes n2, n3, or n4 to assist the packet transmission. There is a hastened need of high Quality of Service (QoS) support. Hybrid networks are constructed by combining wireless networks and MANETs to leveraging each other. Specifically, infrastructure networks meliorate the measurability of MANETs, while MANETs self-organizing networks automatically, extending the coverage of the infrastructure networks [1].

How to ensure the QoS in hybrid wireless networks still remains an open question. In order to enhance the QoS feature of hybrid networks, QoS-Oriented Distributed routing protocol (QOD) is used. QOD binds five algorithms: 1) a QoS-ensured nearest neighbour selection algorithm to satisfy the need in transmission delay 2) to reduce the transmission delay, a distributed packet scheduling algorithm [2] is used. 3) A packet resizing algorithm alters the size of the packet based on the nodes' mobility.4) a traffic redundant elimination algorithm to increase the transmission [2] output, and 5) a data repetition elimination-based transmission algorithm to eliminate the replicating data for further improvement of the transmission QoS.

It has following consequences

1. In EDF algorithm, Task migration cost might be very prominent.
2. The performance of EDF drops in overloaded condition.
3. EDF requires more derivative computations, thus increasing its cost.
4. Performs the task sequentially thus increasing the waiting time.

To overcome all this PSO based QOD protocol is purported. Here PSO algorithm is utilized for neighbour selection because it has flexibility in parameter selection, no derivative calculation and simpler procedure for implementation.

II.RELATED WORK

Mobile ad hoc networking is challenging tasks due to the lack of resources reside in the network as well as the frequent changes in network topology. Although lots of research has been done on supporting QoS in the Internet and other networks, they are not suitable for mobile ad hoc

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networks and still QoS support for such networks remains an open problem. [11] Introduce a new definition of QoS in mobile ad hoc network, and suggested a cross-layer QoS model. Enhanced QoS-Oriented Distributed routing protocol with traffic awareness (TQOD) is in [4] proposed to upgrade the QoS support capability of hybrid wireless networks.

A generic distributed QoS adaptive routing engine (DQARE) architecture was introduced in [2]. DQARE architecture is furnished with three relevant traffic control schemes, namely, service differentiation, QoS routing, and traffic engineering. The main objective of this is to (i) provide a general configuration guideline for service differentiation, (ii) formalize the theoretical properties of different QoS routing algorithms and then introduce a QoS routing algorithm (QOPRA) based on dynamic programming technique, and (iii) propose QoS multipath forwarding (QMPF) model for paths diversity exploitation

III.PROBLEM STATEMENT

Proposed System aims to provide an efficient QOD protocol for the hybrid wireless network. The QoS-guaranteed neighbour selection algorithm is analysed and identified the pulls back of it. So Particle Swarm Optimization (PSO) algorithm is proposed. Here tasks are queued based on their deadline for task completion.

PSO identifies the processor which has less or no tasks and assigns task to processor. Because of this pre-emption will not occur frequently. Processor is utilized expeditiously. Since the process is performed on group of collected task, performance of algorithm will not drops on overloaded situation. By this approach pre-emption cost is minimized, does not require derivative calculation which cuts down the cost of computation and the algorithm complexness is less which reduces the run time cost. Thus the overall cost is reduced by the implementation of PSO based QOD.

Secure QoS-Oriented Distributed routing protocol (SQOD) was suggested in [13] to upgrade the secure Quality of Service (QoS) routing in Hybrid wireless networks. SQOD contain two appliances: 1.QoS-Oriented Distributed Routing Protocol (QOD)-to reduce transmission delay, transmission time. And also enhance wireless network transmission throughput. 2. A new intrusion-detection system for Hybrid wireless networks is implemented by Enhanced Adaptive Acknowledgement (EAACK). It protects Hybrid wireless networks from attacks that have high malicious demeanour detection rate. Analytical and simulation outcome relies on the important human mobility mode. SQOD will offer extremely secured performance in terms of Intrusion detection, overhead, delayed transmission.

QoS based routing protocol was purported in [1] with the aim of increasing QoS support in MANET communication. It integrates following: 1) a PSO based neighbour selection algorithm to meet the transmission need 2) to reduce the time dalay in transmission a distributed packet scheduling algorithm is used [2]. 3) A packet resizing algorithm alters the size of the packet based on the nodes' mobility. By relying on an observation, it has been show that, the PSO based QOD protocol shows improved performance [2].

IV.PSO BASED QOD

A. NETWORK AND SERVICE MODEL CONSTRUCTION

A hybrid wireless network with associate range of base stations spreading over the network is taken into account for this implementation. N nodes are revolving around with in the network [2]. Assumption is made that, each node is equipped with a single WiFi interface. Here, base stations are considered as access points (APs)[2]. APs and mobile nodes enables a communication via WiFi interface.

B. NEIGHBOUR SELECTION & PACKET SCHEDULING

Particle Swarm Optimization (PSO) algorithm is used to identify the nearest neighbour in a better way. Further, the stream transmission time is brought down by distributed packet scheduling algorithm which is proposed for packet routing. The source calculates packet queuing time (T_Q) for each packet in an intermediate node, after receiving message's reply from intermediate nodes which contains the scheduling information of all streams in their waiting line. Then the intermediate node is selected which satisfies following condition

$$T_Q < D_{QoS} - D_{SI} - D_{ID}$$

D_{SI} = Packet Size/ Source Nodes' Bandwidth
D_{ID}=Packet Size / Intermediate Nodes' Bandwidth

Let T_Q denotes the packet queuing time
D_{QoS} denote the delay QoS requirement
D_{SI} denotes the transmission delay between a source node and an intermediate node.
D_{ID} denotes the transmission delay between an AP and an intermediate node.
Packet Size denotes the size of packet.
W_S & W_I denotes the bandwidth of source node and intermediate node.

Here, for selection of a neighbour (intermediate) node PSO (Particle Swarm Optimization) algorithm is applied. T_Q and packets having earliest deadline is given as stimulus to the algorithm for discovering an appropriate neighbour. It assigns packets to the neighbour node which is given as output by PSO algorithm. Selected neighbour will have characteristics of having longer queue length or shorter queue length. Packet with earliest deadline will be assign to the neighbour having shorter queue length and tardiest deadline to neighbour having longer queue. Because of this the delay in transmission a packet stream can be reduced.

C. PACKET RESIZING

The larger size packets are allocated to an intermediate node having infrequent mobility and small size packets are

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assigned to an intermediate node having haunt mobility [2]. This gains the QoS of packet transmissions. For this, packet resizing algorithm is used [2].

It calculates the new size of packet based on the following equation
Packet Size (new) = (lamda/ v) * Packet Size (unit) where Packet Size is packet size, lamada is a scaling parameter and v is the relative mobility speed of the source node and intermediate node [3] and Packet Size (unit) = 1 kb.

D. PACKET FORWARDING

To achieve the fairness in the packet forwarding, Least Slack First scheduling algorithm is used [3] . Packet ps' slack time is defined as

Slack time = current time - persisting packet transmission time

An intermediate node calculates the slack time of each of its packets periodically and sends on the packet wich has minimum slack time. If the same slack time value goes on for more than one packet, then randomly chosen packet is to be sent out.

E. DATA REDUNTANCY ELIMINATION

By eliminate the data redundancy, QoS of the packet transmission in PSO based QOD is amended. For this traffic redundancy elimination (TRE) is applied in QOD. The AP and mobile nodes cache packets and overhear. By overhearing, the receiver of the packet will be known. The source node skims the content for duplicated chunks in its cache, while commencing to send a packet. If the duplicated chunks are find by a sender and it knows receiver who has got this chunk before, then it replace the signature value by this chunk. The signature value is computed by an algorithm named SHA-1. If the AP gets the chunk associated with the signature, it sends a ratification message to the sender and replaces the signature with the associated data chunk. Otherwise, the AP asks the chunk of the signature from the sender. By this approach, the sizing of the message is foster reduced thus increasing QoS functioning of the system.

V.PERFORMANCE EVALUATION

The performance of QOD is compared with PSO based QOD on the ground of number of packets transferred over a period of time. Fig 2& 3 shows the chart representation of number of packets transferred per time in micro second.

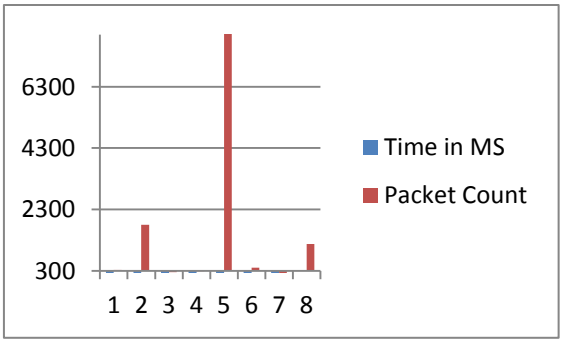

Fig 2. QOD Comparative Chart

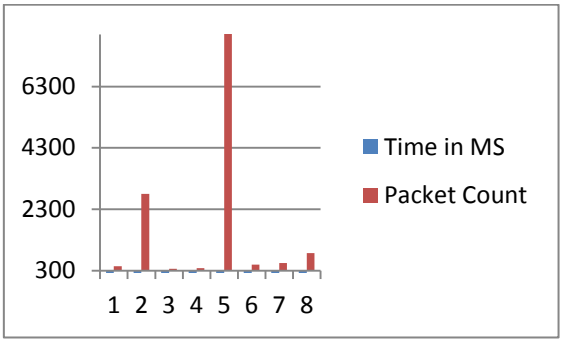

Fig 3 PSO Based QOD Comparative Chart.

The rate of packet transfer is faster in PSO based QOD. Increased transfer rate is achieved by avoiding the pre-emption of task.

PSO effectively optimizes the neighbour selection process. Since packet transfer rate is faster and tasks' pre-emption is understated, recourse is expeditiously utilized, thus results in efficient task completion with less cost.

VI.CONCLUSION

A hybrid network structure constructed by combing Wireless network and MANET. This hybrid structure is awaiting futures expectation. To meet the expectation of future need ie enabling communication at anywhere everywhere concept the PSO based QOD protocol is proposed. Here for neighbour selection the PSO algorithm plays a vital role by identifying an approximate neighbour by taking packets deadline value and the queue waiting time. Since PSO does not involve in derivative calculation, its complexity is less and reduces the computational cost. It also minimizes the task migration thus reducing the task migration cost. The packet is performed based on the mobility speed of the node. Thus adds a value to the PSO based QOD by assigning a large size packet to the less mobility node and small size packet to more mobility node. For early forwarding of a packet least slack first (LSF) scheduling algorithm is utilized. To minimize the bandwidth utilization, traffic redundancy elimination (TRE) algorithm is used. This eliminates the duplicates effectively by using SHA-1 value as signature.

Since there is reduction in computation, task migration, band width utilization and reduced waiting time for resource in a queue reduces the overall cost of the process. Thus achieving cost optimal wireless hybrid network with PSO based QOD.

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