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Selfish Scheduler for Packet Scheduling Based on Packet Weighted Energy Drain Rate in Manets

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ABSTRACT

The aim of our selfish scheduler based on packet weighted energy drain rate in Mobile ad-hoc networks mainly depends on the available least highest-limit of the residual value of a mobile node. The projected work comprises of mechanisms for detecting the selfish node as well as an attitude called rehabilitate-before-malicious behavior for justifying against the malicious behavior of nodes having selfishness. It provides an immediate solution for separating the selfish nodes based on the parameter namely the packet weighted energy drain rate. If PWEDRSS is deployed in an ad hoc environment it not only provides an energetic and immediate solution to become aware of malicious nodes but also can detect selfish nodes which may be fruitless due the deficient energy available, since the restricted battery power is one of the main constraint for all the mobile nodes. The effective and well-organized performances of the projected work are done through ns-2 simulations. The parameters used are the Packet delivery ratio, Throughput, Control overhead, Total overhead and End to end delay. These parameters are computed based upon varying the number of nodes. The outcome forecast that the planned mechanism performs well.

Keywords: Ad Hoc Networks, Selfishness, Reliability, Energy Drain Rate

1. INTRODUCTION

Mobile ad hoc networks avails a collective and limited wireless medium which is employed by all the wireless nodes in the network providing efficient and effective control over this wireless medium is always significant. Several resource allocation attitudes have been contributed for achieving this task (Perkins *et al*., 2002). Although there are several such a resource scheduling algorithm, one of the packet scheduling strategy which considers the bandwidth for packet relay through multiple lines are projected (Broch *et al*., 1998). The above stated solutions primarily targets on get rid of the problems that could occur with multiple sessions while sharing a common wireless links (Das *et al*., 2000). Our Planned mechanism takes into account about the subjects that are distinct to MANET's namely dynamic topology and multihop environment (Anuradha *et al*., 2009). The word "Packet Weighted" in our scheduler scheme infer the suggestion about the consumption of energy, which is directly proportional to the number of packets that are onward by an individual node. The scheduler considered is mostly used in the context of the selfish nodes, which refers to a mobile node that drops the packet that approach from other mobile nodes that drops the packets of its own node (Papadimitratos and Haas, 2002; Ghorpade *et al*., 2008). When we consider the routing of packet through Ad hoc On-Demand Distance Vector (AODV) routing protocol, the selfish node could show any one of the subsequent possible actions in Ad hoc network (Chen and Nahrstedt, 2004).

The consistency of the MANETs communication generally depends upon the implied trust between the nodes clearly trust in the sense refers to the full support which is create between nodes of the network so as to

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ensure correct routing establishment techniques, through which the construction of routing information could be provided (Papadimitratos and Haas, 2002). But this kind of trust may be demoralized by adversary nodes that carry out security violated through attack nodes thus securing MANETs against MAC layer misbehavior has to be dealt and restrained.

2. MATERIALS AND METHODS

2.1. Packet Weighted Energy Drain Rate Based Selfish Scheduler

In our projected work, the main focus is on the reactive routing based protocols in which the route discovery is executed only when a node wants to establish a connection to transmit a data to another node. The routing protocol used for our study is the AODV, an on demand routing protocol.

If the source needs to communicate to a destination node, it generates data packets and transmits them through the Network layer, if there is no possible route from the source to the destination and then it initiates a route discovery process. We take into consideration that communication time is known. A node accepts to communicate the packet as shown in **Fig. 1** only if it has at least Maximum-limit of Residual value.

Algorithm 1: Choosing an Intermediate Node as Selfish Node:

1. A Neighbor Node M receives a RREQ from source;
2. If session_life_time is implied in RREQ then
3. Check 6.
4. If NE_i > (PSWEDR *session_life_time) then
5. Update life-duration field of RREQ.
6. Enable the communication and RREQ route to the Neighbor
7. Else
8. Disable the communication and drop the RREQs.
9. End if
10. Else
11. If NE_i > MAX-LIMIT-RESIDUAL_VALUE then
12. Trigger the M/m/n queue to schedule the packets.
13. Else
14. Presence of selfish node.
15. Trigger the M/m/1 queue to schedule the packets.
16. End if
17. End if

2.2. Packet Weighted Energy Drain Rate Computation

Packet Weighted Energy Drain Rate (PWEDR) is calculated as the difference between the product of number of packets and the energy E_a of the node and the product of number of packets and the energy E_b of the node between a session divided by time interval Equation 1:

$$\text{PWEDR}\left(E_{a-b}\right)=\frac{P_a * \text{Engy}_a - P_b * \text{Engy}_b}{t_b - t_a} \quad (1)$$

When Engy_a and Engy_b are namely the nodes energy at t_a and t_b respectively. The PWEDR is averaged based on exponential averaging with $\alpha = 0.75$.

To manipulate the Average Packet Weighted Energy Drain Rate (APWEDR) we use the formula Equation 2:

$$\text{APWEDR}\} = \alpha * \text{PWEDR}(t) + (1-\alpha) \\ *\text{PWEDR}(t-1)\left(E_{a-b}\right) \quad (2)$$

At the end, when the RREQ packet reaches the destination, it chooses a route that would maximize the life-time of the route by opting the one with maximum life-time of the node.

Algorithm 2: Topology Maintenance by Rehabilitate-Before-Malicious Behaviour at Node N:

1. Compute PWEDR periodically and check NE_i
2. If NE_i<MIN-LIMIT-RESIDUAL_VALUE then
3. Check
4. If N==Non-Selfish node
5. Then

Relay the data packets to all the sources through node N

7. End if
8. If N==Destination
9. Terminate the data replay by sending OCR to all sources that they are be in contact with the destination
10. End if
11. End if

The second Algorithm helps the protocol to route the packet and to rehabilitate quickly to link breakage due to presence of non-co-operating nodes when the energy of a node is fully drained i.e., when the current energy of the node goes below a minimum limit of residual value. The routing protocol reacts to this event and its feature depends in whether the node is a selfish node or a Destination Node. If the node is a selfish node, it sends Optimal Change Request (OCR) packets to all the source nodes through the neighbor's hops towards their respective destinations.

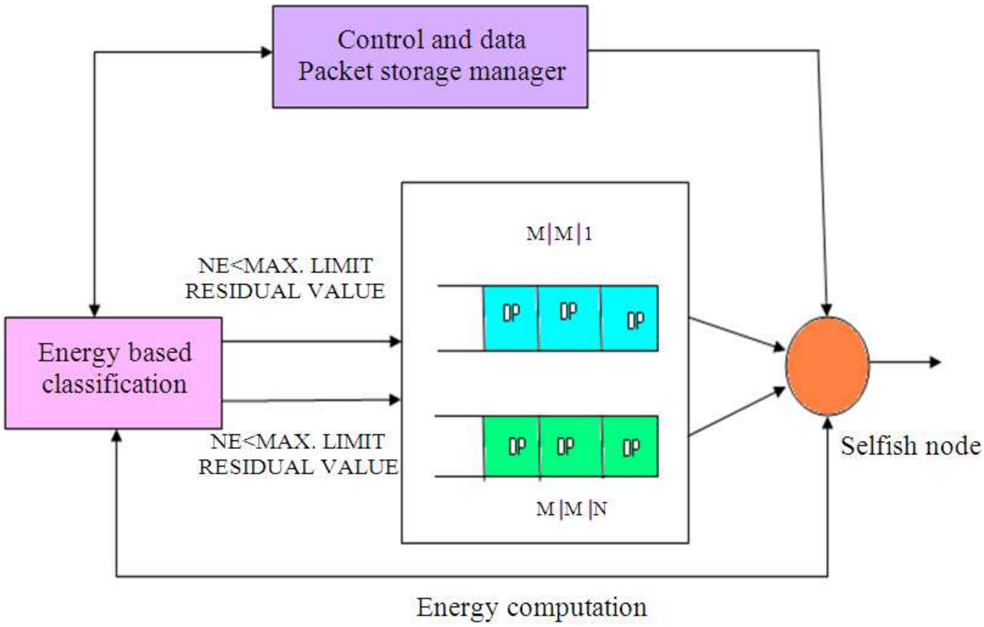

Fig. 1. Selfish sheduler scheme based on packet weighted energy drain rate

Table 1. Simulation parameters

Parameter	Value	Description
Number of mobile nodes in the terrain	50 Nodes	50 nodes are placed in the network
Channel type required	Wireless ad-hoc channel type	Channel type
Propagation type	Two Ray ground model	The radio propagation model
Network interface type	Phy/WirelessPhy type	Network interface type
Interface queue type	M/M/1 and M/M/n	Interface queue model
Antenna type	Omni-directional antenna	Antenna model
Protocol type	AODV	Ad-hoc on demand distance vector
Simulation time	50secs	Maximum simulation time
Size of the packet	512bytes	Variable data packet size
Dimensions of the terrain	1000m×1000m	X and Y dimensions of the motion

The source node on receiving the OCR packet, Originates a new route discovery process for the communication session and hence with high chance obtains a fresh route before an actual link break occurs on the established original route. This could make the packet drops and increase the delay in time and hence enables the protocol to enhance rapidly to the network topology changes, if an alternate route to the desired destination exists. If the node being drained is a destination node, then it sends a request the source to stop all data routing to itself. When the request reaches the source, further replay of the data are prohibited. This may reduce the number of packet to be lost in the network and thus reduces packet delivery ratio and reduces resource usage by avoiding packet transmissions to unavailable destinations.

3. RESULTS

The Network Simulator intialisation is specified in **Table 1**. used for our study is ns-2.in our simulation 50 mobile nodes were placed randomly in a terrain area 1000×1000 m.2 Mb/s is the wireless channel capacity used in our simulations. Each of the simulations is run for 50 sec.

The Packet Weighted based Energy drain rate scheduling scheme are applied by varying the number of mobile nodes and the packet size. The proposed methodology is compared with the selfish aware queue scheduler. For each and every node a Constant Bit Rate (CBR) source has been utilized. A node transmits varying number of packet size. The random way model is used for simulation. The maximum allowed speed for a node is 10 m sec^{-1}. The following performance metrics are used to compare the two scheduling algorithm are the packet delivery ratio, control overhead, total overhead, End-End delay and through put.

3.1. Performance Metrics

For performance estimation of this scheme the succeeding metrics are used.

3.2. Packet Delivery Ratio

Packet delivery ratio is the relation of the total number of data packets sent to the receivers to the total number of data packets received by the receivers.

3.3. Control Overhead

Control overhead is the relation of the total number of the control packets transmitted by the sender to the number of data packets delivered to the receivers.

3.4. Total Overhead

Total overhead can be defined as the total number of data packets and control packets transmitted to the total number of the data packets delivered.

3.5. Throughput

It may be defined as one of the dimensional parameter which represents the fraction of channel capacity utilized for reliable transfer of data from the source node to the destination nodes.

3.6. End to End delay

It may be defined as the time gap between the times of packet origin to the time upto the last bit arrival of the packet to the target.

3.7. Performance Evaluation of SSQM

3.7.1. Packet Delivery Ratio

Figure 2 shows the comparison chart between the Packet delivery ratio and the number of mobile nodes for two strategies, they are without PWEDRSS and with PWEDRSS. The graphical illustration apparently describes that the decrease in packet delivery ratio is due the increase in selfish behavior. When the reactive scheduling mechanism is deployed packet delivery ratio increases.

The chart make known that the packet delivery ratio get decreased in the network when the selfish node behavior takes place but can be increased on an average by 38% when the PWEDRSS strategy is provided to isolating selfish node using weighted energy drain rate for the packet. The packet delivery ratio obtained through this solution is optimal and efficient.

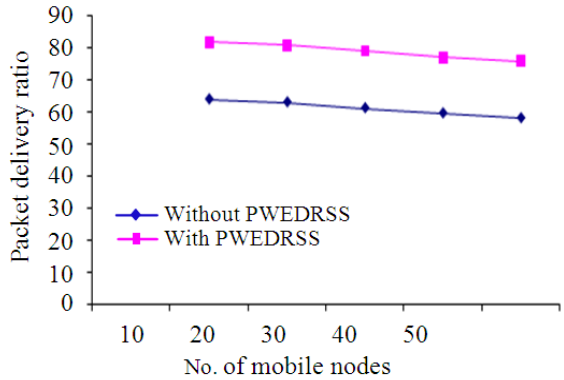

Fig. 2. Packet delivery ratio for PWEDRSS

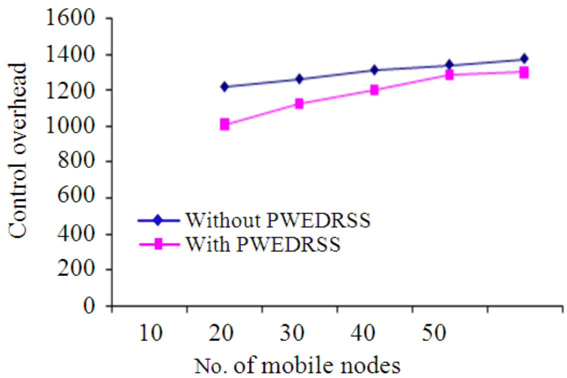

Fig. 3. Control overhead for PWEDRSS

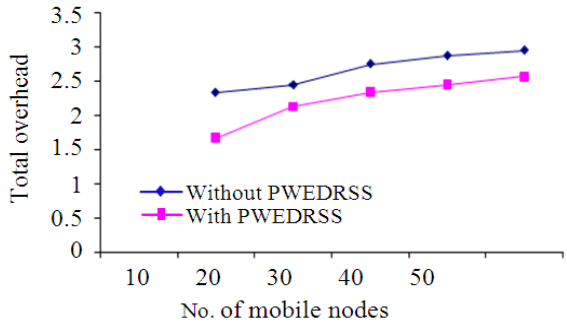

Fig. 4. Total overhead for PWEDRSS

3.8. Control Overhead

Figure 3 depicts the shows the comparison chart between the control overhead and the number of selfish nodes for two strategies, they are without PWEDRSS and with PWEDRSS. The graphical illustration apparently describes that the increase in control overhead, with the increase in selfish behavior. When the reactive scheduling mechanism is deployed control overhead decreases.

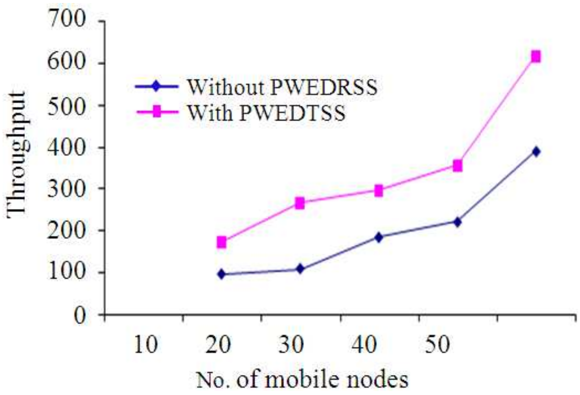

Fig. 5. Throughput for PWEDRSS

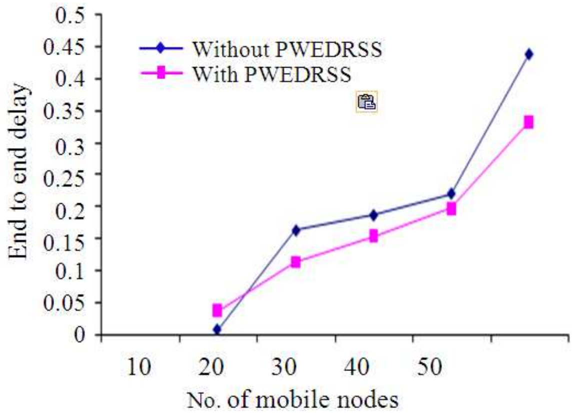

Fig. 6. End to end delay for PWEDRSS

The chart reveals that the control overhead ratio get decreased in the network when the selfish node behavior takes place but can be increased on an average by 17% when the PWEDRSS strategy is provided to isolating selfish node using weighted energy drain rate for the packet.

3.9. Total Overhead

Figure 4 shows the comparison chart between the Total overhead and the number of selfish nodes for two strategies, they are without PWEDRSS and with PWEDRSS. The graphical illustration apparently describes that the increase in Total overhead due to the increase in selfish behavior. When the reactive scheduling mechanism is deployed total overhead decreases.

The graph portrays that the Total overhead get increased in the network when the selfish node behavior takes place but can be decreased on an average by 21% when the PWEDRSS strategy is provided to prevent the attack.

3.10. Throughput

Figure 5 shows the comparison chart between the throughput and the number of selfish nodes for two strategies, they are without PWEDRSS and with PWEDRSS. The graphical illustration apparently describes that the decrease in throughput due to the increase in selfish behavior. When the reactive scheduling mechanism is deployed throughput increases.

The graph portrays that the throughput get decreased in the network when the selfish node behavior takes place but can be increased on an average by 22% when the PWEDRSS strategy is provided to prevent the attack.

3.11. End to End delay

Figure 6 shows the comparison chart between the End to End Delay and the number of selfish nodes for two strategies, they are without PWEDRSS and with PWEDRSS. The graphical illustration apparently describes that the increase in end to end delay due to the increase in selfish behavior. When the reactive scheduling mechanism is deployed end to end delay decreases.

The graph portrays that the end to end delay get increased in the network when the selfish node behavior takes place but can be decreased on an average by 28% when the PWEDRSS strategy is provided.

4. DISCUSSION

A new scheduling algorithm Packet weighted Energy Drain Rate based Selfish Scheduler (PWEDRSS) was discussed related to the parameters throughput,end to end delay,packetdelivery ratio,control overhead and total overhead by varying themobile nodes and it is proved that PWEDRSS performs better.

5. CONCLUSION

In this study, Packet weighted energy based scheduling strategy is revealed. This mechanism work out the energy based on the number of packets transmitted by a node, through which scheduling decision could be made. By means of simulation, the algorithmic performance can be compared. Evolution analysis foretells that this solution performs better. In the near future, this mechanism can be used to prevent traffic congestion.

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