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# Cross Layer based Delay aware MANET protocol for computer network applications

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**Abstract-** In military applications portable impromptu system assumes vital job since it is explicitly structured system for on interest prerequisite and in circumstances where set up of physical system is beyond the realm of imagination. This uncommon sort of system which takes control in framework less correspondence handles genuine difficulties carefully, for example, profoundly powerful and dynamic military work stations, gadgets and littler sub-arranges in the combat zone. Along these lines, there is an appeal of planning productive directing conventions guaranteeing security and unwavering quality for fruitful transmission of profoundly touchy and secret military data in barrier systems. With this goal, a power proficient system layer directing convention in the system for military application is planned and mimicked utilizing another cross layer approach of configuration to build unwavering quality and system lifetime up to a more noteworthy degree. Be that as it may, here PDO-AODV approach not backings to ideal way choice. So we propose another ACO-DAEE (Ant settlement enhancement with postpone mindful vitality proficient) for ideal way choice and moderating the defer time in system framework. The primary objective is to keep up the ideal courses in system, amid information transmission in a proficient way. Our reenactment results show that ACO-ADEE performs to a great degree well as far as bundle conveyance proportion, end to end postponement, and throughput. Recreation results through NS2 programming to check the viability of our strategy.

## I. Introduction

The huge mechanical revival of remote report [1] has been risen in the arrangement of mobile ad hoc networks mobile ad hoc networks (MANETs) in current decade. MANETs are amazing systems administration structure that is based with no settled structure. As a result of the profoundly unique, to a great degree portable and self-configurable nature of its self-sufficient hubs, execution of this system is extraordinary as far as transmission, throughput and dependability.

Mobile ad hoc networks [1] have vital application and tasks in combat zones and in a fiasco circumstances, for example, arrangement of systems, high safety efforts in the system, any conclusion to end transmission, portable availability without disappointment, against sticking instrument, and so forth. All system movement must be done immediately with no connection disappointment even in smaller scale second dimension. The fighters amid on line fight ought to have the capacity to remain persistently associated with one another with the end goal to get any most recent data, or order from their boss or to talk about before any activity. In some cases entrance of the satellite signs isn't attractive to

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caverns or thick backwoods or under ocean places where it is again testing to support network.
Many research works have concentrated on the security of MANETs. The greater part of them manage counteractive action and identification ways to deal with battle individual getting rowdy hubs. In such manner, the adequacy of these methodologies ends up powerless when various pernicious hubs conspire together to start a community oriented assault, which may result to all the more pulverizing harms to the system.

## II. Related work

In past works [2], control delay improved AODV convention is a steering motor that is the controller of all capacities in the versatile work station. Successively it performs three critical errands amid static or portable position of a hub and after a bundle touches base to a hub, for example, the channel detecting, the smaller than expected database dealing with module and the wise choice taking sub module. In the principal sub module of channel detecting, status messages are transmitted occasionally with formal intrusion of time by the hub with the end goal to communicate nearness of that hub in the channel. In the following sub module a little database is kept up to hold and review directing data's with respect to a specific way, which can be alluded next time information transmission happens between same sender and recipient. An edge esteem is determined specifically methodology to choose the following jump station according to the calculation as given underneath, which will be utilized in the steering choice module to at last select a reasonable station. We existed a cross layer component between the information connect layer and the framework layer by presenting a well-disposed parcel between the two layers. To diminish the overhead of course finding as far as deferral and power utilization we recommend that this neighborly bundle gives essential data from the information get to interface layer to its upper system layer. Built up an enhanced channel get to procedure at the MAC layer make it good to work with PDO-AODV.

## III. Proposed framework

In this section, we present our model, **ACOB**ased **E**fficient **R**outing protocol for MANET with **D**istance, **E**nergy, and **L**ink quality.The model is shown in figure 1 which consists of three main components -Trust Model, Optimal Forwarder Selection Function and Improved Pheromone Update Model.

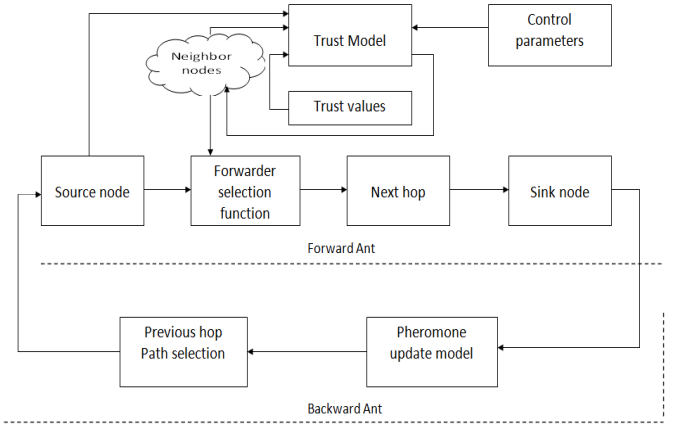


**Figure1: ACO based efficient routing framework**

### A. Trust model

In Trust Model, nodes rate each other by using the information of their own direct interactions with their neighbors. This is termed in the literature as First Hand Information (FHI). In order to make the rating unbiased, the nodes also collect their neighbors' interactions with that node being rated considered as indirect interaction. This rating information collected from the neighbors is also known as Second Hand Information (SHI). The simulation period is now divided into 'n' slots where each slot consists of two sub-periods -Forwarding and Monitoring Interval, TFMI followed by Update Interval TUPI as shown in Table1.

| [1] Initialization [2] Phase | [3] $T_F$ MI | [4] T UP I | [5] $T_F$ MI | [6] T UP I | [7] .. | [8] $T_F$ MI | [9] T UP I | [10] . | [11] $T_F$ MI | [12] T UP I |
|---|---|---|---|---|---|---|---|---|---|---|

**Table1: simulation period slots**

### B. Forwarder selection function

Forwarder Selection Function is a probability function that is used at every node along the path from source to sink node in the network to select the

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best next neighbor to forward the packet to the sink node. The Forwarder Selection Function must always choose an optimal path from source to the sink to forward the packets with the sole objective to improve the Network Lifetime by balancing the energy among the nodes in the network to ensure that some nodes along the path do not get depleted fast and at the same time selecting good quality links along the path to guarantee that node energy is not wasted due to too frequent retransmissions.

With these objectives in mind, we have used the Forwarder Selection Function, FSF, a probability function to select the best forwarder node among the neighboring nodes of the current node, which is based on Pheromone Trail (PT) and heuristic function involving two parts representing Node Energy level (EN) and node link quality (LP) functions. Pheromone Trail (PT) represents the concentration of pheromone deposited on the path between the nodes considering Energy, distance and link quality along the path (containing the link between current and neighboring nodes) from source to destination. In other words, higher PT represents the better good quality path from source node to the destination in terms of energy, distance and link quality. Node Energy (EN) function represents energy level of the neighbor node and Link quality (LP) function represents the quality of the link between the current node and the neighbor node under consideration.

The Forwarder Selection Function is a probability function which must always choose an optimal path from source to the sink to forward the packets with multiple objectives:

- To provide a secure trustworthy path from source to sink by avoiding insider attacks,
- To improve the Network Lifetime by balancing the energy among the nodes in the network to ensure that some nodes along the path do not get depleted fast (resulting in Network disconnections or partitioning)
- At the same time selecting good quality links along the path to guarantee that node energy is not wasted due to too frequent retransmissions.
- Further, selection of shorter paths involving less number of nodes resulting in further saving of energy due to less number of nodes participating in packet forwarding.

Forwarder Selection Function, FSF $(n_i,n_j)$ to select the best forwarder node $n_j$ among the neighboring nodes of the current node $n_i$ can be defined as

FSF $(n_i, n_j)$ =

$$\begin{cases} \frac{[PT(n_i,n_j)]^{\alpha}[EN(n_j)]^{\beta}[LP(n_i,n_j)]^{\gamma}[TR(n_i,n_j)]^{\delta}}{\sum n_j \in NBS(n_i)[PT(n_i,n_j)]^{\alpha}[EN(n_j)]^{\beta}[LP(n_i,n_j)]^{\gamma}[TR(n_i,n_j)]^{\delta}} & if\ n_j \in \\ 0 & oth \end{cases}$$

…..1

Where NBS $(n_i)$ represents the set of neighboring nodes of$n_i$, PT $(n_i,n_j)$ represents the concentration of pheromone deposited onthe path between the nodes $n_i$ and$n_j$, EN $(n_j)$ represents the energy level of the neighbor node$n_i$. TR $(n_i,n_i)$ represents the Trust rating of the neighbor node $n_j$ as given by node$n_i$.

LP $(n_i,n_j)$ represents the quality of the link between nodes $n_i$ and$n_j$, i.e., link probability. The Expected Transmission Count, ETX is a measurement of the transmission link which is calculated based on the past events occurred on that link.

Then the link probability LP $(n_i,n_j)$ between nodes $n_i$ and $n_j$ is given by the expression:

LP $(n_i,n_j)$ = $\frac{1}{\text{ETX}\,(n_i,n_j)}$…….2

α, β, γ, δ are the parameters to control the significance or importance of pheromone trail of the path, node energy level, link quality between nodes and node trust rating. When α= β =γ = δ =1, all four parameters PT, EN, LP, TR are given equal importance in the selection of the forwarder node. If one is interested in giving higher importance to TR, node trust rating, then one could make α=β =γ =2,δ =1, similarly α=2, β =1,γ =δ =2 to raise importance of EN, Node Energy Level, α=2, β =δ=2,γ =1 to make importance of link quality more significant in the selection of forwarder node.

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Let EI $(n_j)$ be the initial energy of node $n_j$ and ER $(n_j)$ be the Remaining (Actual) Energy of node $n_j$, then the Node Energy level, EN $(n_j)$ is defined as

$$EN(n_j) = \frac{ER(n_j)}{EI(n_j} \; Where \; ER(n_j) > E_{th} \ldots\ldots 3$$

**C. Pheromone Model**

It has been observed that the amount of pheromone computed to be placed on the path during return journey is not proper to reflect that path as the optimal during the simulation period. Strongest path should have largest amount of pheromone whereas weakest path should have least amount of pheromone or almost zero. Among the competing stronger paths for selection, the variations in pheromone concentration should be such that always strongest path is selected.

Keeping these in mind, pheromone update model has been designed considering the parameters the forward ant has collected during its travel from source to the destination. Once the forward ant reaches the destination, the following parameters collected by the forward ant are analyzed.

## IV. Result and discussion

Our investigations are directed utilizing the NS-2.34 test system. We direct the examinations in two stages. The underlying advance is to check the feasibility of our arrangement, and afterward more profound examination is examination is done to evaluate the deferral and throughput in more detail.

In the initial step, there are 40 versatile hubs in the system, and correspondence begins from source to goal. Here bounce to jump correspondence happens and we can ascertain the separation dependent on position of an individual hub. The individual correspondence between client to client, quantities of information streams estimated. Here we can realize the transmission rate of each hub dependent on pheromone esteems. In our work, we can keep up power and postponement for individual hubs and finding the ideal way for determination of a directing.

The connections among mobile nodes are UDP connections, and we send CBR (Constant Bit Rate) traffic in each communication channel. The CBR rate of the connections is 512Kb/s. The size of the scenario field is 1500m x 1500m. The routing protocol we use is a revised AODV routing protocol that integrates our ACO-DAEE, PDO-AODV methods.

**Simulation table:**

| PARAMETER | VALUE |
|---|---|
| Application traffic | CBR |
| Transmission rate | 5 packets/sec |
| Radio range | 250m |
| Packet size | 1000 bytes |
| Channel data rate | 2Mbps |
| Maximum speed | 20m/s |
| Simulation time | 10secs |
| Number of nodes | 40 |
| Area | 1500x1500 |
| Routing protocol | AODV |
| Routing methods | PDO-AODV, ACO-DAEE |

**Table2: simulaton table for network process**

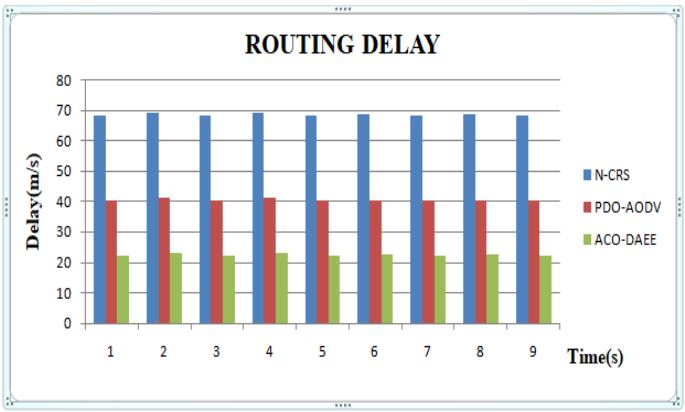


**Figure2: NETWORK DELAY**

The above graph represented as delay time in network, and it can be depends on time to vary the output. Here its depend on number of packets travelling and delivered as per process. Here each packet travelling time based on that delay time measured. The performance of the ACO-DAEE

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decrease the delay time in network compare to Power and Delay Optimized-AODV method and Cross Layer Power Control method.

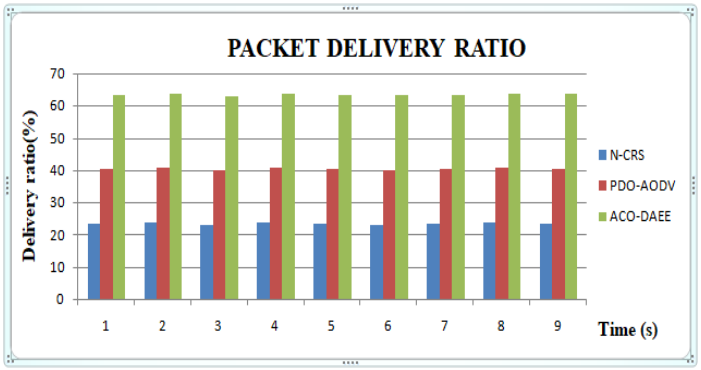


**Figure3: Packet delivery ratio**

The above graph represented as packet delivery ratio, and it can be depends on time to vary the output. Here its depend on number of packets travelling and delivered as per process. The performance of the ACO-DAEE improves the delivery ratio compare to Power and Delay Optimized-AODV method and Cross Layer Power Control method.

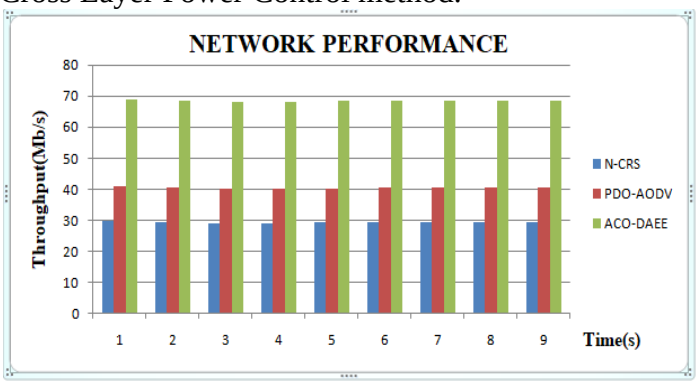


**Figure4: Network performance**

The above graph represented as Throughput, and it can be depends on time to vary the output. The performance of the ACO-DAEE improves the throughput compare to Power and Delay Optimized-AODV with DDOS attack algorithm and Cross Layer Power Control method.

## V. Conclusion

In this examination, creators investigated the issue of intensity productivity, hub determination and uncalled for load adjusting for portable specially appointed systems utilizing a connection based cross layer component. They concentrated on enhancing join cost dependent on power and postpone metric to relieve this serious issue reestablishing valuable system assets. Notwithstanding this we have utilized a kinship based handshaking utility as a cross layer approach between information connect layer and system layer to quicken the directing layer process. Here accumulation of information and deferral on directing all the more so we proposed ACO (ant colony optimization) with postpone mindful vitality proficient technique. This convention takes care of the asset limitation issue of impromptu system, as it were, and the reproduction think about demonstrates that it indicates preferable execution over other driving MANET conventions dependent on comparative cross layer approach. We additionally directed recreation by utilizing NS2 and exploratory results exhibit that our ACO-DAEE is useful for the segregate defer mindful hubs and enhance the execution proportion in system.

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