A Trusted Node Based Checkpointing Scheme for Mobile Ad-hoc Networks (MANETs)

Gurbhej Singh, Aayushi Chadha
Universal Institute of Engineering & Technology, IKG PTU Jalandhar

Abstract- Mobile Ad-Hoc Network (MANET) is a collection of mobile nodes that can communicate with each other using wireless links but MANET do not use any hardware for storage, for that use check point but which nodes will be a check point, it is a decision problem which is selected in this paper by using flower pollination algorithm. In our experiment, we compared check point cost in form of time and number of check point and FPAM show effective less cost.

Keyword - *Checkpoint, FPA, cost, MANET*

I. INTRODUCTION

Proactive protocols send solicitations to their neighbors for drawing a network topology. At that point, the routing table is fabricated by them. In Reactive protocols having information for send, they approach their neighbors for route. The neighbors broadcast the demand in the event that they don't have any known route. On the off chance that the last goal has been achieved, at that point it forwards an answer back to the source. At that point the source transmits the information on the newfound route. Hybrid protocol consolidates the advantages of proactive and reactive routing. One of the principle issues is fault tolerance in mobile ad-hoc network [1]. The framework capacity of reacting to a surprising software or hardware disappointment is known as Fault tolerance. Check pointing utilizes stable storage accessible in the conveyed framework for sparing the reliable procedures conditions to which they would rollback be able to at the recuperation time. Check pointing is the exceptionally helpful strategy for giving fault tolerance. Checkpointing algorithms based rollback-recuperation strategies can be arranged into two categories [2]: a) Coordinated checkpointing and b) Uncoordinated checkpointing . Uncoordinated checkpointing which permits each procedure the most extreme flexibility in choosing when to take checkpoints. In uncoordinated check pointing approach each procedure does not have the learning of different process but rather it takes checkpoint freely. Coordinated checkpointing or Synchronous checkpointing is a regularly utilized method to forestall finish misfortune or disappointment of calculation. In the framework each procedure is occasionally saved money on the steady storage, which is known as a procedure checkpoint. To recoup from a disappointment, the framework restarts its execution from a past predictable worldwide checkpoint saved money on the steady storage and it doesn't experience suffer of the domino effect [3][4].

Coordinated checkpointing takes after two-stage confer structure. Procedures take temporary checkpoints in the principal stage and these are made changeless in the second stage. In coordinated check pointing approach, before taking checkpoint all procedures synchronize with each other through control message. These synchronization messages make the framework free from domino effect. There are two sorts of coordinated check pointing algorithm. These are: i) Non-Blocking and ii) Blocking. In blocking algorithm all procedures are blocked when checkpoints are being taken. So the execution time of the procedures increments. In non-blocking algorithms process are not blocked when checkpoints are being taken.

The check pointing design for MANET is quite challenging and got some attention in literature reviewed. For implementation clusters which depend on distance and energy minimization, we proposed flower pollination algorithm.

We now present the idea of "centrality". In the networks setting, it is regularly central to figure out which hubs and edges are more basic than others. Exemplary illustrations incorporate distinguishing the most important expressways in a road network, the most compelling individuals in an informal community or the most basic useful elements in a network. Thus, the idea of centrality, which plans to measure the importance of individual nodes in a network and check pointing decision, has been widely examined in network examination. In this manner, the quantity of check focuses and cost of checkpoints are assessed.

II. LITERATURE REVIEW

In Garg and Kumar's paper [1] a non-blocking coordinated check pointing algorithm utilizes just least number of procedures to take lasting checkpoint. It additionally lessens the message multifaceted nature by addressing the limitations amid check pointing, separations and so on. The conditional checkpoint is reliant on a solitary procedure disappointment. Delicate checkpoints are utilized to beat this effort in the

Mobile Hosts (MHs). A mobile Host is a PC which is associated with alternate PCs through remote network.

A Mobile Support Station (MSS) is the uncommon hub through which a mobile host speaks with other mobile hosts. Each MSS keeps up refreshed checkpoint succession number [csn] which keeps up the correct conditions. The advantages of this procedure are: here least quantities of procedures are required and it decreases the message multifaceted nature. And the disadvantage is that, if a procedure is occupied with some high priority strategy when a checkpointing demand touches base at it, at that point it won't take a checkpoint. Later the checkpointing algorithm must be restarted once more.

In new superior check pointing approach, Gupta, Rahimi &Liu proposed an appropriate algorithm [2] for circulated mobile registering framework. They confronted an issue in the non-blocking checkpointing algorithm with temporary checkpoints. On the off chance that a procedure is occupied with some high priority strategy when a checkpointing demand touches base at it, at that point it won't take a checkpoint. Later the checkpointing algorithm must be restarted once more. Instead of taking temporary checkpoint the algorithm utilizes least number of procedure to take checkpoints and it additionally utilizes few control messages.

The advantages of the algorithm is that i) It doesn't take any temporary checkpoints and consequently the overhead of changing over temporary checkpoints to perpetual one is evacuated contrasted with [1], [4] and [5]. In mobile registering there are numerous new issues, similar to absence of stable storage, low bandwidth of remote channels, high portability and constrained battery life [5] and so forth. These issues make traditional checkpointing algorithms not reasonable for checkpointing mobile dispersed frameworks.

Least process Coordinated checkpointing is great way to deal with present fault tolerance in a disseminated framework straightforwardly. This approach is without domino. Here Kumar, Kumar, Chauhan and Gupta proposed a non-meddlesome least process [5] synchronous checkpointing protocol, where just the base number of provisional checkpoints is taken. They additionally advanced the quantity of futile forced (changeable) checkpoints and message overheads when contrasted with [4]. The primary thought of this paper is that, the authors proposed a checkpointing protocol for mobile conveyed frameworks, where no blocking of procedures happens. They additionally made a procedure to keep correct csn of all procedures' latest perpetual checkpoints. They attempt to catch the immediate and additionally transitive conditions at the outset and a base set is formed in the first place. On the off chance that new conditions are made amid checkpointing, they are additionally dealt with. Here less number of pointless variable or forced checkpoints is utilized.

The plan in Tuli and Kumar's paper [6] is based on Cluster Based Routing Protocol (CBRP). This algorithm delivers a predictable arrangement of checkpoints and just least quantities of hubs in the cluster are required to take checkpoints. It additionally utilizes not very many control messages [6]. Ad hoc networks have as of late been considered as an important research documented. Clustering of MH gives a framework to asset administration. The primary advantage of clustering is lessening the quantity of messages sent to each Base Station (BS) from every hub, channel get to, control and bandwidth control. In cluster based design, entire network is separated into a few clusters and in each cluster, network chooses one hub to be called as cluster head. The fundamental advantages of this algorithm are least quantities of procedures take the checkpoint and it limits the quantity of control messages required. It additionally does not take pointless checkpoints and when a cluster head comes up short it decreases the vitality utilization and recuperation inertness.

III. FLOWER POLLINATION ALGORITHM

Flower pollination optimization algorithm (FPOA) is a recently invented optimization algorithm. It is inherited from the natural inspiration of pollination process. It mimics the process of flowering planets reproduction via pollination. As pollinators are mainly responsible for transferring pollens among flowers, pollination may occur in either local or global flow. Pollination process can fall into two form categorizes; biotic and abiotic based on the pollens transferring mechanism.

For biotic pollinations, flowers always depend on insects and/or animals as pollinators to transfer the flowering pollens. However for abiotic, flowers do not need any pollinators for the pollens transferring process. Naturally most of flowers considered to follow the biotic pollination form. This indicates that pollination or crosspollination process can take place by pollinators' movements or travelling long distances causing a global pollination. Travelling pollinators are usually follows the L'evy's flight behavior. Their flying steps are also follows the L'evy's flight distribution. For each kind of pollinators, there is a specific type of flowers that it is responsible for, this called flower consistency. Flower consistency helps to minimize the cost of investigation of each pollinator. Evolutionary wise, it increase the transferring time of pollens and hence optimize and maximize the reproduction process. With the limited available memory of pollinators, flower consistency eliminates the learning, investigation and switching. Furthermore, it can be considered as an incremental step based on the similarity/difference of any two flowers.

The biological objective of flower pollination is to optimally reproduce a new enormous generations of the flower kind with the fittest features that ensure the kind`s survival. In order to ideally formalize the flower pollination algorithm, characteristics of pollination process, flower constancy and pollinator behavior should be approximated based on the following essential rules:

i. Global pollination achieved by L'evy's flights` travelling pollinators for both biotic and cross-pollination.
ii. Local pollination achieved abiotic and self-pollination.
iii. The new generation reproduction probability depends on the flower consistency and proportional to flowers` similarities/differences.
iv. The switch probability $p_S \in [0, 1]$ controls the shift between local and global pollination.

The simple flower pollination model assume that each plant has only one flower, and each flower only produce one pollen gamete. Thus, there is no need to distinguish a pollen gamete, a flower, a plant or solution to a problem.

Algorithm: FPA Module

Step 1: Min or max Objective F(u), where u=(u_1,u_2,……..u_d).
Step 2: Initialize m pollen gametes or flower population having random solutions.
Step 3: The best solution $\boldsymbol{S_*}$ is found in the initial population.
Step 4: A switch probability is defined as $\boldsymbol{p_S \in [0, 1]}$.
Step 4.1: In case T<MaxGen, for i=1:m
A step vector l (obeys Levy distribution) is drawn as $\boldsymbol{p_S > rand}$, the global pollination

$$\boldsymbol{u_x^{1+1} = \gamma l(S_* - u_x^t) + u}$$

Where,
$\boldsymbol{\gamma}$ is the scaling factor for step size control,
$\boldsymbol{u_x^t}$ is the solution vector at t iteration,
$\boldsymbol{x, y\ and\ n}$ are the pollens
Step 4.2 : Otherwise, drawing $\boldsymbol{\epsilon}$ with uniform distribution [0,1]
So, local pollination $\boldsymbol{u_x^{1+t} = \epsilon(u_y^t - u_n^t)}$
Step 5: New solution is evaluated as the solution obtained are better and updating the population.
Step 6: Best current solution is found.

IV. SYSTEM MODEL DESCRIPTION

Step1: Deploy the Manet Node and make random cluster base on distance
Step2: Initialize the flower pollination algorithm with objective function minimizing energy
Step3: After making cluster calculate the trust value and make check point
Step4: Calculate trust value by Network analysis by game theory
Step5: Trust value indicates or predict how much possibility node disconnection
Step6: Evaluate the cost, and number of check points

V. EXPERIMENTAL RESULTS

Check pt.	Proposed Cost (ms)	Without Optimization (ms)	Existing Cost (ms)
1	1.19	4.402	2
2	43.12	75.8402	73.1843
4	108.36	171	178.633
6	209.92	329	309.2177
8	413.15	557	542.0996
10	774.176	957.631	933.6266

Table 1: Performance comparison table

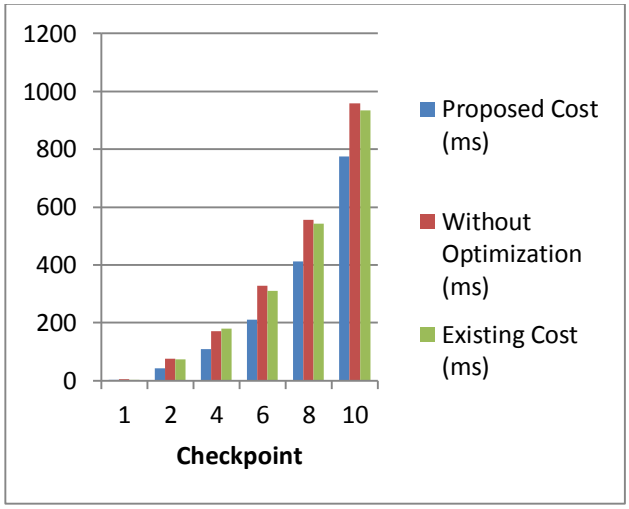

Figure 1: Performance comparison graph

VI. CONCLUSION

We have designed a new trusted node based check pointing algorithm which is very effective to the data by the trusted node that is selected by iterative optimization FPA. Travelling pollinators are usually follows the L'evy's flight behavior. Their flying steps also follow the L'evy's flight distribution. For each kind of pollinators, there is a specific type of flowers that it is responsible for, this called flower consistency.

VII. REFERENCES

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