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Analysis of Failure Detection in MANET

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Abstract- **In this paper we propose failure detection service for MANET using an cluster based approach. Our failure detection service detect node to the MANET. The proposed approach uses a heartbeat based testing mechanism to detect failure in each cluster. The development of an efficient failure detection service in MANET is more difficult than in traditional distributed system [7] due to two major problems such as (i) Scalability due to their large size and (ii) Message loss due to the high probability of message loss that may cause frequent false detection and make it difficult to let every non faulty node in the system be aware of detected failures Failure detection has been identified as a basic component for many reliable distributed middleware services and . A value faulty node may also corrupt the header of the message. There are an increasing number of faults in MANET day by day.**

Keywords - **Manet, Cluster, Heartbeat, Failure Detection**

I.INTRODUCTION

A mobile ad-hoc network is a group of mobile nodes forming an ad-hoc network without the assistance of any centralized structures. These networks introduced a new ability of network association and can be well suited for an environment where either the infrastructure is lost or where deploy an infrastructure is not very cost effective. The popular IEEE 802.11 "WI-FI" protocol is capable of providing ad-hoc network facilities at low level, when no access point is accessible. However in this case, the nodes are restricted to send and receive information but do not route anything across the network. Mobile ad-hoc networks can activate in a standalone fashion or could possibly be coupled to a larger network such as the Internet

Mobile ad-hoc networks can spin the dream of getting connected "anywhere and at any time" into reality. Typical application examples include a military operation or a disaster recovery. Not bound to particular situations, these networks may equally show enhanced performance in other places. As an example, user can imagine a group of peoples with laptops, in a business conference at a place where no network services is present. They can simply network their machines by forming an ad-hoc network. This is only single of the many examples where these networks may possibly be used [2].

The research on failure detection and monitoring in wireless adhoc networks and sensor networks are lagging behind in past. Recently, some of the approaches can be found in [6-7]. In order to address the above problems, this paper proposes a failure detection service based on the clustering of nodes in a manet. We show that the clustering is useful in handling these issues and in building scalable.

II.ISSUES IN MANETS

In MANETs communication among nodes is done through the wireless medium .MANETs have a random topology because nodes are mobile and may join or leave the network. Nodes in transmission range of each other are called as neighbours. Neighbours can send directly to each other. However, when a node wants to send data to another non- neighbouring node, the data is routed through a sequence of multiple hops and intermediate nodes acting as routers. There are numerous issues to consider when deploying MANETs. [11] The following are some of the main issues.

- **Unpredictability of environment**
  Ad hoc networks can be deployed in unknown terrains, unsafe conditions, and even hostile environments where tampering or the actual destruction of a node may be coming up. Depending on the environment, node failure may occur normally.
- **Unreliability of wireless medium**
  Communication through the wireless medium is unreliable and subject to errors. Moreover, due to changing environmental conditions such as high levels of electro-magnetic interference (EMI) or stormy weather, the quality of the wireless link may be unpredictable. Also, in some applications, nodes may be resource-constrained and thus would not be able to support transport protocols necessary to ensure reliable communication on a lossy link. Consequently link quality may fluctuate in a MANET.
- **Resource-constrained nodes**
  Nodes in MANET are usually battery powered as well as limited in storage and processing capabilities. In addition, they may be situated in areas where it is not possible to re-charge and thus have limited lifetimes. The available bandwidth of the wireless medium may also be limited because nodes may not be able to sacrifice the energy consumed by operating at full speed.
- **Dynamic topology**

The topology in an ad hoc network may change frequently due to the mobility of nodes. Some links break and at the same time new links between nodes are created when nodes move in and out of range of each other.

III.FAULT DIAGNOSIS

With the fast development of mobile ad hoc networks (MANETs), fault diagnosis has become a significant need to assure robust service for a variety of applications. Fault diagnosis put extra burden on the sensor node besides with their normal task and it will also consume extra energy of the sensor nodes. Many techniques have been recommended to solve this problem, but they still cannot satisfy the particular need of MANETs. Fault identification is one of the important parts in many protocols. When any altered behavior is shown by system or nodes of the network, a diagnosis function is started to find out which node(s) has (have) shown abnormal behavior. This is called as Diagnosis; diagnosis is classified based on the occurrence of fault. It is basically classified as static diagnosis and dynamic diagnosis.

In static diagnosis, the faults are not occurring during the diagnosis session.

In dynamic diagnosis, the faults can occur during the diagnosis session, which is difficult to handle because node can be faulty after it has been diagnosed as fault-free by other node.

The Heartbeat Approach

The most general method for monitoring crash faults is the heartbeat mechanism. The classical heartbeat approach [14] is based on the continuous monitoring of a node to know whether it is alive or not. Thus, each mobile transmits periodically an "*I Am Alive*" message to mobiles that monitor its state. After the running out of a timeout, if a mobile *x* does not receive such a message from one of the neighbours, say *y*, it is in charge of detect its failure, then it starts suspect it as organism faulty

IV. FAILURE DETECTION

Failure detection is handled by using a heartbeat based mechanism within each cluster, in which each node periodically sends a heartbeat message to the CH of the luster. To check the frequent false detection we are using an adaptive timeout based heartbeat mechanism, which makes the algorithm adaptive to network load and processing load. If the CH do not receive heartbeat message within timeout period from a node then the node is considered to have failed.

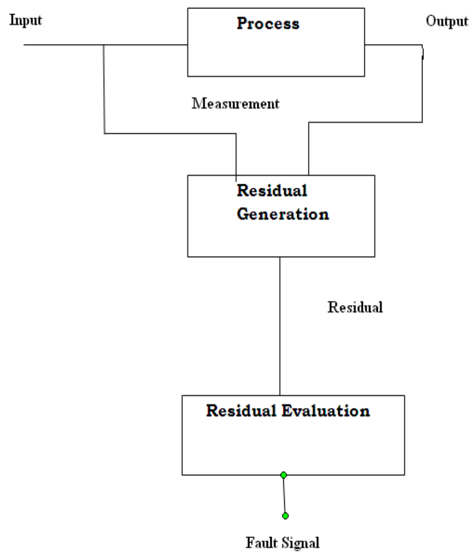


Figure 1 Fault Detection Identification structure

The heartbeat messages are two types: (a) initiation heartbeat message and (ii) response heartbeat message The format of the heartbeat message sent by a node u consists of four fields: (u, v, diagnostic value, message code) u and v are the sending and receiving nodes respectively.

V. RELATED WORK

Hatem S. A. Hamatta et al The level of power available is one of the main concepts which concern all of ad hoc wireless networks. Since, all of these networks are construct without any communications, where it based on the mobility of nodes that prevent the usage of any fixed infrastructure such as power cables. Hence, the power utilization is an important factor which affects the network life-time and broadcast range. For that, the power utilization rate must be distributed for every node and the overall power of broadcast must be minimized for each connection request, also the congestions must be decrease. A clustering system is used in the adaptation of MANETs to be energy capable. a simple system which maintains the idea of Cluster Head election that allow mobile nodes to automatically make best clusters that use an optimal scenario of cluster formation and maintenance which conserve the power energy consumption, and increase time of ad hoc wireless network's devices. The main idea is to dividing wall the network into position of clusters, and also finds the best scale of clusters according to power level of all nodes in each cluster.

Pabitra Mohan Khilar et al. consequent work has focused on singular property and classifications of failure detectors . the detection parameters to the in progress load of the network such that the failure detection time is a function of preceding heartbeat messages. However this move toward lacks scalability and is not applicable to the large scale wireless ad hoc network. The drawback of this approach are poor clustering algorithm and great failure detection time

Arun Subbiah at al The problem of distributed diagnosis in the occurrence of dynamic failures and repairs is considered. To address this problem, the idea of bounded correctness is defined. surrounded correctness is made up of three properties: bounded diagnostic latency, which ensures that in sequence about state changes of nodes in the classification reaches working nodes with a bounded delay, bounded start-up time, which guarantee that working nodes resolve valid states for every other node in the system within bounded time after their improvement, and accurateness, which ensures that no false events are recorded by working nodes. It is shown that, in order to realize bounded correctness, the rate at which nodes fail and are repair must be limited.

VI. Purposed Algorithm

In this Algorthim, nodes are grouped into clusters for the purpose of testing. The number of nodes in a cluster, its size, is for all time a power of 2 and system itself is a cluster of N nodes.

1. Create Cluster
2 Assumes all the nodes are fault free at the initial stage of algorithm execution.
3 Nodes send heartbeat req msg
    Send k_hbm (k, m, D_m, init_hbm_msg)
    Set_Timeout (Tout)

4 Nodes send heartbeat res msg
    response r_hbm (m, k, D'm ,res_hbm_msg).

5. Timeout: the nodes that did not reply within time Tout are diagnosed as faulty.
    f=N (initnode_id)-ff
if (f=N (initnode_id)) Then
// the diagnosis is complete, if all its neighbours' are faulty .
Terminate=True
End if

Table 1 Notation used in diagnosis algorithm

Notation used in diagnosis Algorithm Symbols	**Description**
init_hbm_msg	initiator heartbeat message
res_hbm_msg	response heartbeat message
F	number of faulty Nodes

VII. Result Analysis

A simulator is designed in MATLAB language where we current experimental results of diagnosis on large network using Adaptive distributed diagnosis algorithm obtain through simulation. The experiments were conducted for the network of varying sizes of 8, 16, 32 nodes.

Step:1**:** First of all a system having 8 nodes is grouped to create a cluster

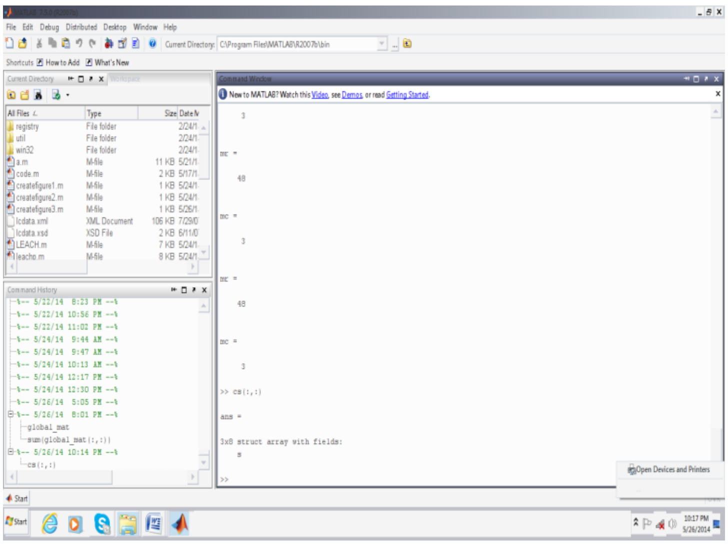
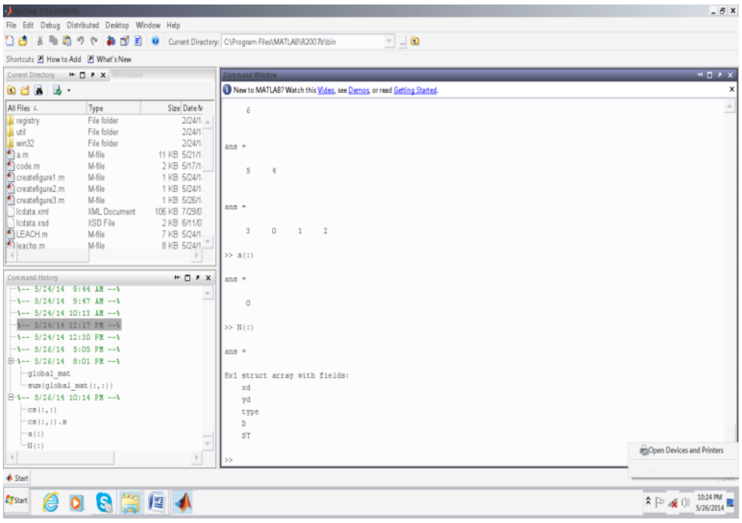


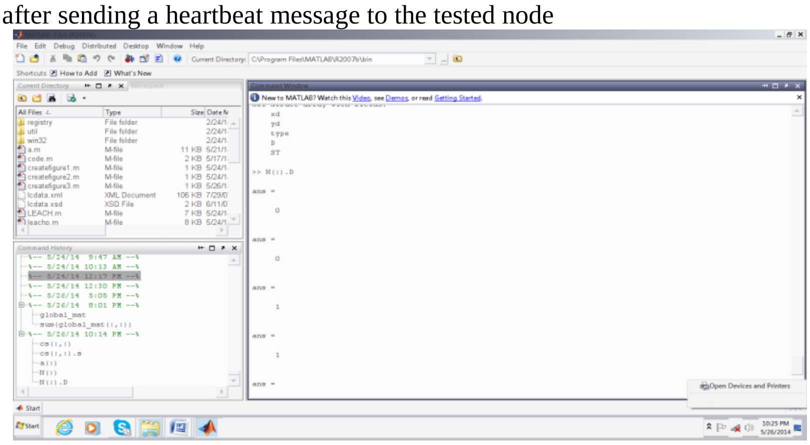
Fig 1 Create a Cluster

Step 2 Array: Show the size of $C_{p,k}$ with fields xd , yd, type ,D(Diagnosis),ST(Status Table).

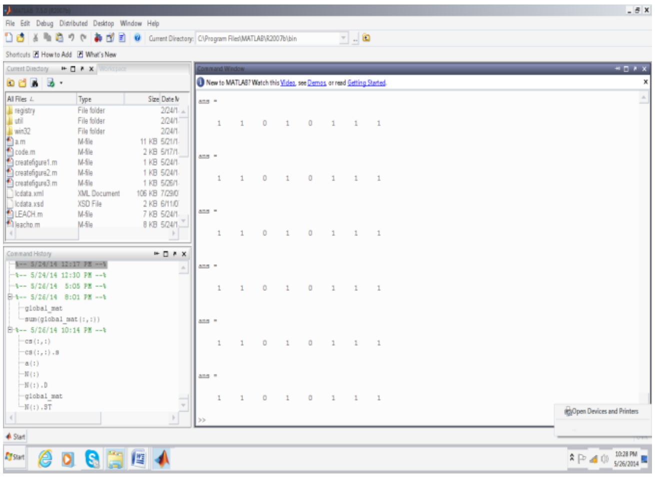


Step 3: Diagnosis information

Diagnosis process is started by the initiator node by sending the request heartbeat message to the tested node. An initiator node maintains a time out value after sending a heartbeat message to the tested node

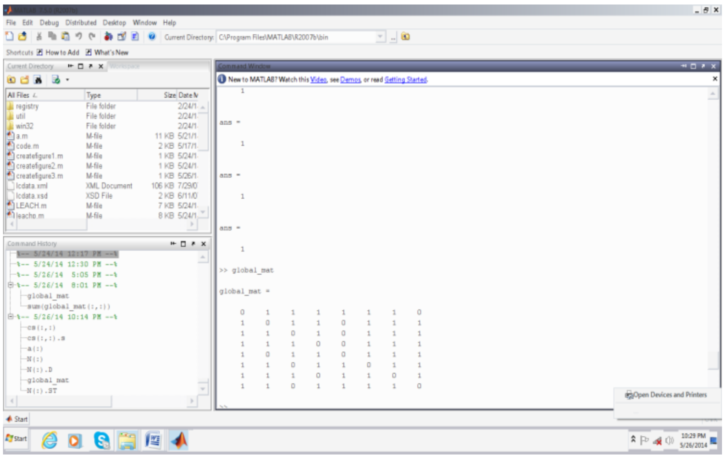


Step 4: Status table: To maintain the status of nodes about the entire network each initiator node maintains a vector called as Status Table



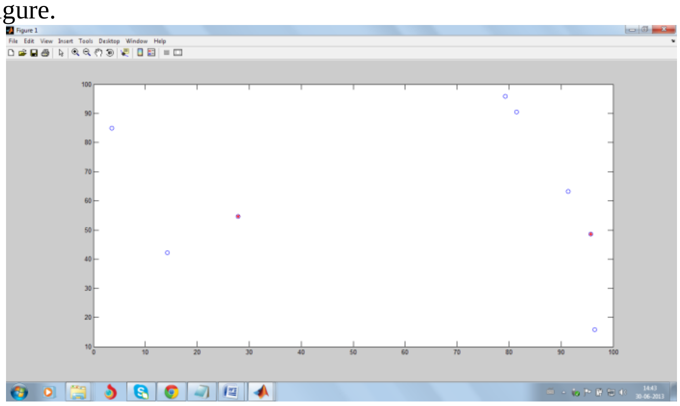
Step :5Global diagnosis message

Every initiator node prepares a global diagnostic message using local diagnostic message and further disseminates the diagnosis information throughout all the nodes to provide a global and consistent diagnostic view by every fault free node of the entire MANET.



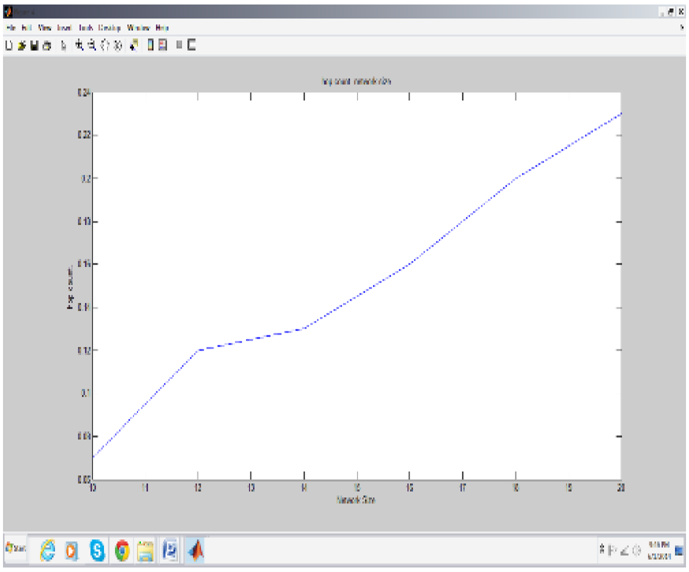
Step 6:Threshold

Now to display faulty and fault free nodes, the threshold for each node is calculated and compared with a presumed threshold value equal to 6, .those nodes having threshold greater than or equal to 6 are considered faulty and the rest of the nodes are fault free shown by red circles in the figure.



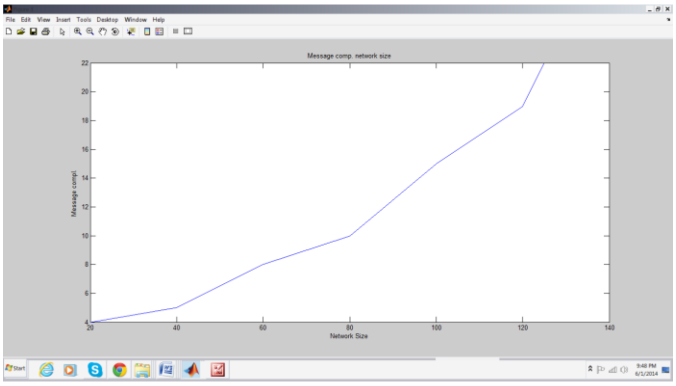
Hop-count

The number of hop counts for the proposed diagnosis algorithm to complete fault diagnosis for network of different sizes is shown in figure. Hop count on an average is being calculated as the ratio of the Euclidian distance between the source and destination node in the simulation and the number of nodes in between the source and destination node.



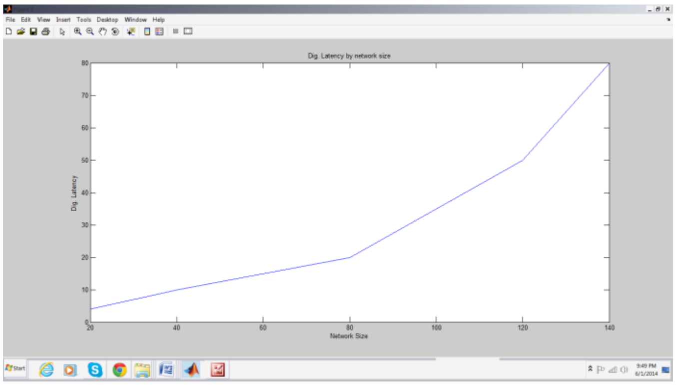
Message Complexity

Figure shows the number of messages versus number of nodes. Message complexity i.e. total number of messages exchanged increases linearly with the number of nodes and found to be O(N.Cm,k).This shows the proposed diagnosis algorithm is linearly scalable



Diagnostic Latency

The diagnostic latency for the proposed algorithm using clustering is shown in figure. As the network size increases, the diagnostic latency using clustering increases but in general there is a significant reduction in diagnostic latency by using clustering as compared to the diagnostic latency without using clustering. This shows that the proposed algorithm is suitable for large MANETs deployed in hostile and harsh environments.



VIII. Conclusion

In this paper we introduced an failure detection service using an heartbeat approach. Result explain different sizes of nodes test The results are show for the dissimilar types of nodes and take the different values of threshold. the threshold value which tell how a lot information is faulty Finding the faults in MANET is the important aspect.

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