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Energy Aware Trust based System For Enhancement of Mobile Healthcare Reliability and Security

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Abstract— **The main objective of healthcare networks is to provide reliability and security for the confidential information transfer. This introduction of pervasive communications using mobile systems has benefited both the healthcare systems as well as the patients. The existing Trust Evaluation Model manages the nodes dynamically by obtaining the trustworthiness of every node in the network . This method allows only authentic nodes to participate in the communication and also detects the misbehaving nodes. Efficient utilization of the available energy resources is needed to reduce network failures. Failure of any node due to battery draining may result with adverse effects if the particular node is critical node like commander node. The nodal lifetime is of major concern in efficient energy utilization. The nodal lifetime here is defined as the time to first node failure due to battery draining. The proposed work is aimed at enhancing the existing work though considering the energy of the node along with the trust value of the node. While selecting the trusted node here , energy of the selected node is also considered to transfer the data. This Energy Aware Trust Based System shows an increase in the number of alive nodes when compared to the existing system . The proposed protocol performance is estimated using Network Simulator (ns-2) and compared with existing system which shows an enhancement of network's security .**

Keywords— **Energy Trust based system , Alive nodes , Pervasive Communications.**

I. INTRODUCTION

Security in mobile healthcare systems is becoming an important research topic and many solutions are applied to prevent malicious behaviour from revealing confidential data.

Telemedicine was developed several decades ago with the establishment of various computer technologies such as interactive video , pattern recognition computer and assistant therapy. Yet, wireless technologies further advance the improvement of healthcare units by introducing mobile, reliable, and extensive healthcare applications , such as the availability of mobile emergency care and medical surveillance. This introduction of pervasive communications using mobile systems has benefited both the healthcare systems as well as the patients. Since the present method of patient monitoring is endless and automatic, which can expose ailments at an initial stage and helps in better treatment in advance. This helps the patient to get better medical care at a faster rate. Mobile healthcare allows doctors and surgeons to view the patient's medical details irrespective of any place and any time. Timely analysis of the ailment helps in monitoring the patient's status, and thus issue prescriptions appropriately.

MANET's are one of the best examples of mobile healthcare units . In such networks , all mobile medical accessories are considered as mobile nodes. Due to the advancement of mobile computing, one best utilization is mobile ad hoc networks (MANET's)[1] . MANET's allow the nodes to move randomly without any existing infrastructure . Another important example of pervasive computing is body sensor networks (BSNs) [2] . BSN's allow the patients to attach the sensor devices that are portable, compact and convenient. These sensor devices can supervise patients at any time and place. This shows that health guiding systems are incorporated in our daily lives . In BSN's , a huge number of sensors are available which are used for computer benefited restoration and initial revelation of medical problems[3]. Definitely, these important uses of mobile networks reform present healthcare systems.

A Trust Evaluation model which manages the nodes dynamically has been used in the existing methods . This model helps to conveniently calculate the node activities in a distributed manner . In this model , in order to attain protected communication among various nodes , the multicast mechanism has been implemented. This is generally done by identifying the malicious nodes depending on the trust values of every node present in the MANET. The cooperation between nodes is indispensable and intermediate nodes play an important role in the process of securing the network.

II. RELATED WORK

Generally , Trust is defined as the amount to which a node is authentic, dependable and secured during the process of data transfer in the medical network [4] . The concept of trust is present in medical network security as well as mobile network [5]. Hence , trust is defined as collective relationship between two authentic medical nodes for a particular purpose: one node is named the Object. The object forwards packets to the alternate node named the Subject. By this relationship , the notation T(Subject, Object) denotes the trust relationship between the Subject and the Object. For Example , if the node

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X is the Subject and node Y is the Object, then the representation is given as

The trust of X toY is T(Y,X)
The trust of Y to X is T(X,Y)

In this method , if any one of the nodes has to achieve a specific activity , a trust relationship is established between the two communicating nodes .For Example, when 'X' successfully sends a packet to 'Y', then 'Y' considers 'X' as an honest node and increases its trust value T(Y,X) because of X's honest behaviour with respect to Y. Similarly, If X acts as a malicious node due to its dishonest behaviour, then X is considered as a suspicious one and is penalized for its behaviour.The trust value T(Y,X) decreases respectively.

In m-healthcare systems , any node can get a new trustvalue or reduce its trust value depending on the nodes behavior in a dynamic environment. Hence only when the node is honest enough for another node , it allows the nodes to engage in the communication process originated by that node. This results in every node having different trust values with respect to the other nodes present in the network.

III. EXISTING (TRUST EVALUATION) MODEL

This trust based model uses the approach of community . Every central node present in the network will acknowledge its neighbouring nodes placed at a one hop distance. When considering as a community, it might include some misbehaviouring nodes. This model uses a trust evaluation method and does not classify the nodes like the existing method.

Consider the scenario with the respective source and destination . If it is in different communication range, the intermediate nodes need to route the information .While transmitting the packet to the intermediate or neighbour nodes , the required nodes should be trusted . Consider the node A, node B, node C and node D are the required routing nodes. When the source node initializes the communication , it adds the nodes in neighbour list . If that node satisfies the trust requirement of the source node , it is added into neighbour list .If it does not satisfy the trust requirement it will consider the node as an attacker. The source node does not commit that node in the data transmission. Only trusted node can participate in the system to transfer the data. It also considers the past historical data or past behaviours of the neighbours to evaluate the trust value of the neighbours.

The interval between two consecutive updates of hello considered as session . This model helps in managing the network in a decentralized manner and the security overhead is reduced than the existing model .

IV. ENERGY AWARE TRUST BASED MODEL

Efficient utilization of the available energy resources is needed to reduce network failures. Failure of any node due to battery draining may result with adverse effects if the particular node is critical node like commander node. The nodal lifetime is of major concern in efficient energy utilization. The nodal lifetime here is defined as the time to first node failure due to battery draining. The proposed work is aimed at enhancing the existing work though considering the energy of the node along with the trust value of the node. While selecting the trusted node here energy of the selected node also considered to transfer the data.

TABLE 1 SIMULATION MODEL

Simulator	**Network Simulator 2**
number of nodes	Random
Topology	Random
fixed setup	Source, Sink, Surface Gateways
interface type	Phy/WirelessPhy
mac type	802.11
queue type	Droptail/Priority Queue
queue length	200 Packets
antenna type	Omni Antenna
propagation type	Tworay Ground
routing protocol	AODV
transport agent	UDP
application agent	CBR
transmission power	Vary at each Layer(0.2-1.0)
reception power	Vary at each Layer(0.2-1.0)
sense power	0.1watts
idle power	0.0watts
initial energy	100Joules

V. PERFORMANCE EVALUATION

Compare to existing method, Energy aware trust based system shows an increase in the number of Alive nodes. Energy is the important factor for the sensor network, while calculating the trust value of the system it also considers the energy of the node to transfer the data to the destination.

Fig. 1 shows the random deployment of nodes in a network simulator 2(NS2) environment. By using the Energy aware trust based model , the source selects the node with

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maximum trust value and energy value present in one hop distance.

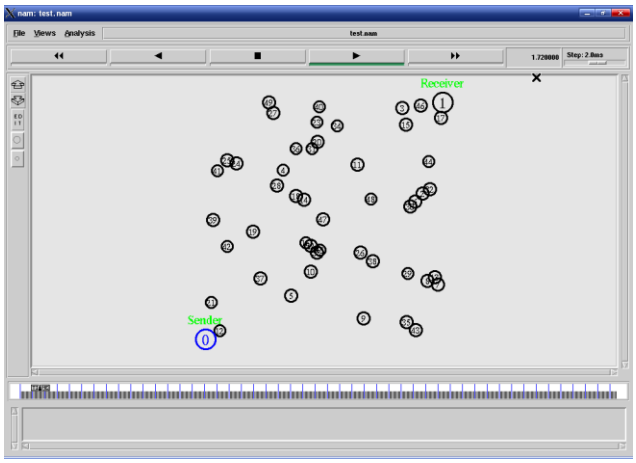

Figure 1 . Initial Deployment of nodes randomly

Once it selects the best node,the data is transferred to it. This process is continued until it reaches the destination.This is implemented in NS2 as shown in Fig. 2.

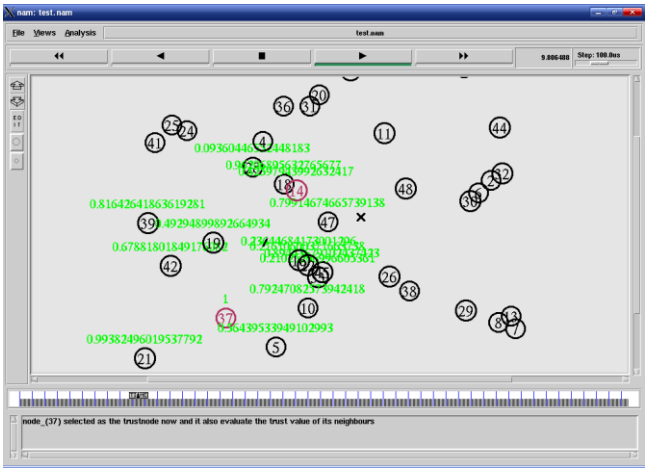

Figure 2. Source checks nodes with maximum trust and energy value

The number of alive nodes present in both the existing model as well as the proposed model has been calculated .There has been an increase in the number of alive nodes present in the energy based trust system than the existing model.

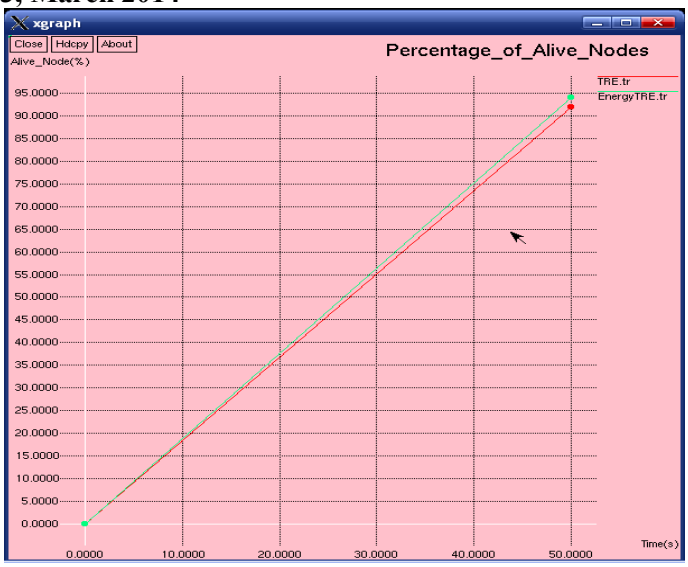

Figure 3. Percentage of Alive nodes vs time

VI. CONCLUSION

The establishment of mobile healthcare units can enormously improve the benefits for hospital systems as well as patient monitoring. This method provides improved condition of patient care by decrementing the usage of administrating and medical costs for patients and clinics. Security in MANET's has increased the research issues in wireless and ubiquitous healthcare systems .This method of energy based trust evaluation , that does not follow a centralized management , is introduced . The trustworthiness of mobile healthcare systems which are considered as medical nodes are managed dynamically. This structure of multicast mechanism provides security to dynamic networks as well as mobile healthcare units.Hence,the analysis of the experimental results for the energy aware trust based model improves both the security as well as increasing the percentage of alive nodes than the exiating model . This method also shows an reduction in the complexity when compared to the traditional trust schemes which helps in improving the efficiency .

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