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Technique for Packet loss Minimization in Group Mobility for Heterogeneous Wireless Networks

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***Abstract*--**A handoff scheme is essential to provide continuous connections whenever a mobile node moves from one coverage area of network to another. The handoff management issues consist of finding the appropriate time to perform the handoff depending upon RSS (received signal strength), traffic, bandwidth, velocity, channel conditions and cost etc. Finally, a scheme supporting group mobility came into picture, is the scheme having a protocol for mobile groups that allows a single node (gateway node) to perform handoffs on behalf of all group members. If the gateway node is damaged or destroyed, communication by the remaining group members with the backbone network is severed, resulting in packet loss. This paper proposes an effective mobility scheme that minimizes the packet loss in Group mobility environment.

Keywords: Group Mobility, Heterogeneous Wireless Networks, Handoff, Packet Transmission, Packet Drop

I. INTRODUCTION

Wireless access networks have become available almost everywhere and current research strives to make them pervasive. Users having wireless access to the Internet are driving the demand for mobile and heterogeneous solutions where services could be accessed from anywhere, any time and from any device. Future wireless connectivity will be provided through a mix of coexisting heterogeneous access network technologies.

In the mobility environment, if a large number of nodes attempt to perform the handshaking associated with a handoff within a short period of time, a number of problems arise. First, the number of collisions over the wireless interface is likely to be high, causing additional power drain to occur from supplementary transmissions. These collisions will also result in delay, which may cause problems for applications that are delay sensitive. There is little need in sending multiple handshaking messages for mobile node to a new access point if we expect the arrival of a group. If one node could represent the remainder of the group and take care of the handshaking messages with a new base station, a much more efficient mobility model would be created. This solution is referred as *group mobility [1]*.

We leverage naturally occurring hierarchies in heterogeneous mobile sensor networks to select nodes as "gateways" between their group and IP access points. These gateway nodes perform a Mobile IP handoff on behalf of all group members at each new point of attachment [2]. These gateways also obscure the membership and topology of their groups to external entities by acting as network address translation (NAT) devices [3]. In so doing, this method allows groups of mobile nodes to use native protocols to manage communication and mobility within their group. This property makes the group mobility solution suitable for different types of mobile network, including ad hoc networks and networks of mobile sensors.

This paper proposes, describes and validates solutions to enhance mobility in heterogeneous access networks. In this work, the study focuses on the various mobility and handoff management issues in Heterogeneous wireless network. The main concern in this paper is to minimize the packet loss in Group mobility environment. There are different methods of doing this. First, *the node handoff method* there if the nodes are disconnected from their Group Head, then they are connected to their nearest Group Head. Second, *Group Head Switch method* there if more no. of nodes are disconnected from their Group Head, then the Group is reconstructed again and new Group Head is elected which has more no. of connections with other nodes in its region within that group.

The remainder of this paper is organized into following sections: Section II gives related works, Section III describes the problem at intersection, Section IV describes Algorithm and their steps, Section V gives the simulation setup, Section VI gives Simulation Result, and Section VII gives conclusion and future scope.

II. RELATED WORK

The novel architecture is proposed to increase the performance of moving wireless networks through provision of QoS. This architecture provides mobility management with group handovers across various access networks' domains. A distributed and non-uniform intelligence across the internetwork architecture is assumed in this option. Each network is an administrative domain inter-working and cooperating with each other to provide enhanced services to their users, but they are owned by and under control of their respective operators. The access network cores are inter-connected via a logical interfaces enabling interworking at the network and service layers. This architecture does not suggest any alteration to the existing network architecture, other than creating interfaces among the networks involved.

Yusof, et al. [4] present a traffic driven handoff management scheme which control the handoff time according to the load status of cells. In this approach, before accepting a new user, it requests the load information of the target cell in advance before handoff execution [5]. Then, the value of adaptive RSS is used in the scheme to initiate the right handoff time [6]. This scheme can efficiently manage overloaded traffic in the system. Selvakumar, et al. [7] propose a vertical handoff decision algorithm in heterogeneous wireless network based on the Velocity of mobile node and the Adaptive traffic load balanced handoff management scheme which adaptively control the handoff time according to the load status of cells. This algorithm considers the handoff when the velocity increases with effective reduction of probability of handoff and efficiently manages further overloaded traffic in the system [8].

Traditional handoff algorithms cannot keep both the average number of unnecessary handoffs and the handoff decision delay low. In making handoff decisions, they do not exploit the relative constancy of path loss and shadow fading effects at any location around a base station [9]. This information can be used to improve the efficiency of handoff decision algorithms; this is used in the new handoff algorithms using pattern recognition [10]. Namee, et al. [11] present an overview of the current research into multicast mobility handoff between 3G mobile network and WLAN, discuss the handoff process and problem and propose a new research program to develop a framework for managing multicast mobility. Zahran, et al. [12] propose a new vertical handoff algorithm using the receiving SINR (signal to interference and noise ratio) from various access networks as the handoff criteria. By converting the different receiving SINR values, the handoff algorithm can have the knowledge of achievable bandwidths from all access networks, and make handoff decisions with multimedia QoS consideration [13, 14]. The performance of RSS based vertical handoff differs under different network conditions, for different thresholds setting [15]. Whereas, the new SINR based vertical handoff algorithm is able to consistently offer the end user with maximum available throughputs during vertical handoff. It is better adaptive to different network conditions, such as different noise level and load factor.

Mobility Management protocols have traditionally supported the mobility of individual nodes and are therefore not optimized to support the migration of groups. The time required to re-establish connectivity, frequency of dropped packets and contention for the air interface increase significantly for mobile groups. Traynor, Patrick, et al. [1] propose a protocol for mobile groups that reduces all of the above by allowing a single node to perform handoffs on behalf of all group members. This “gateway” node eliminates the need of multiple handoff messages by obscuring group membership to external parties [16].

III. PROBLEM AT INTERSECTION

In the group mobility environment, if the gateway node is damaged or destroyed, communication by the remaining group members with the backbone network is severed [17]. To get rid of these problems, we divide the disconnected nodes in two categories depending upon the packet drop in packet data transmission after shifting of nodes. One, if the packet drop is greater than 3 packets and less than 4 packets during transmission after shifting of nodes and the other, if the packet drop is greater than 5 packets during transmission after shifting of nodes. These two categories compose two operations Node Handoffs and Switching Group Heads.

IV. ALGORITHM

This algorithm computes Node Handoff Count, Group Head Switch Count, Group Handoff Count and Groups in Regions Count.

A. Steps of Enhanced Algorithm:

```
Algorithm (Nodes, N)
/*Define a Network with N Nodes*/
{
a.  Set the Parametric Value for Each Node in terms of
    Frequency Range and Sensing Range for Each Node
b.  Set the Group Threshold Value for Network group
    Formation
c.  For i = 1 to N
      [Process All Nodes]
      {
d.  For j = 1 to N
      [Set the Relative Analysis Node]
      {
e.  if(Distance(Nodes(i),Nodes(j))<SensingThreshold)
      {
f.  Count = Count + 1
       [Find the Connectivity Count for Group]
         }
         }
g.  if (Count > GroupThreshold)
     [Check the Minimum Group Limit for Group
    Formation]
       {
h.  Set Nodes(i).Type=GroupLeader
      Group.Add(Nodes(i))
      [Set the Node as Group Leader]
         }
i.  For j=1 to N
      [Process All Nodes]
       {
j.  if(Distance(Nodes(i),Nodes(j))<SensingThreshold)
       {
k.  Nodes(j).GroupLeader = Nodes(i)
           }
          }
         }
l.  Count Groups within Regions
m.  Perform Nodes Random Shifting
n.  Check Group Heads with respect to their Regions
o.  Count Group Handoff within Regions
p.  Perform Communication between Nodes(j) and
    GroupLeader(i)
q.  if (Communication=Successful)
        {
r.  SET CommCount = CommCount + 1
         }
s.  else
        {
t.  Set DropCount=DropCount+1
          }
```


u. if(Distance(Nodes(i),Nodes(j))>Sensing Range)
{
v. Print "Handoff Performed"
Set Nodes(j).GroupLeader = 0
Perform the Process Again to Identify Next Effective Group Leader
}
w. If (DropCount > Threshold)
{
x. Set Nodes(i).Type = Normal
Group.Remove(Nodes(i))
[Remove the Node as Group Head and Idenitfy Next Group Leader]
}
}

V. SIMULATION SETUP

The Heterogeneous Wireless Network (HWN) Mobility scenario created in MATLAB simulator has mobile nodes that have the area of 100 x 100 units with 4 regions having radius 35 units. Each node moves in random direction in group having 100 rounds for its communication. Sensing range of each node is 30 units and group threshold to become a group is 10 units. After each round, the node handoff and the group reconstruction is done depending upon the dropping of packets.

Simulation Parameters are as follows:

Table 1 Simulation Parameters

Parameters	Values
Number of Nodes	100
Communication Rounds	100
Area	100x100
No. of Regions, Type, Radius	4, Circle, 35
Sensing Range	30
Group Threshold	10
Handoff Threshold	3
Group Head Switch Threshold	5

VI. SIMULATION RESULT

For analysing the performance of the Group Mobility for HWN with Packet loss minimization with respect to Efficient Group Mobility for HWN with the help of xgraphs in MATLAB, the different parameters are used like

a. Packet Transmission
b. Packet Drop
c. Node Handoff Count
d. Group Head Switch Count
e. Group Handoff Count
f. Group in Regions Count

The simulation results and the performance comparison are as follows:

a. Packet Transmission: Packet transmission is the sending or receiving of packets from source to destination. The packet transmission is more in the proposed scheme as compared to Efficient Group Mobility Scheme as shown by Figure 1 due to

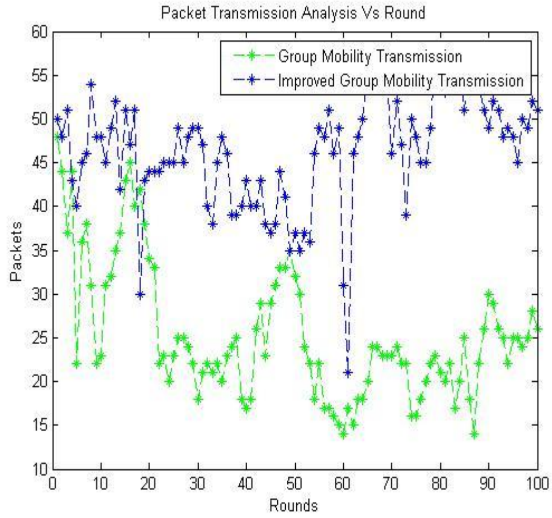

Figure 1 Packet Transmission

the node handoff and group reconstruction. As the round increases, packet transmission is not decreasing exponentially in the proposed scheme.

b. Packet Drop: Packet drop is the failure of one or more transmitted packets to arrive at their destination. The packet drop is less in the proposed scheme as compared to Efficient Group Mobility Scheme as shown by Figure 2 due to the node handoff and group reconstruction. As the round increases, packet drop is not increasing exponentially in the proposed scheme.

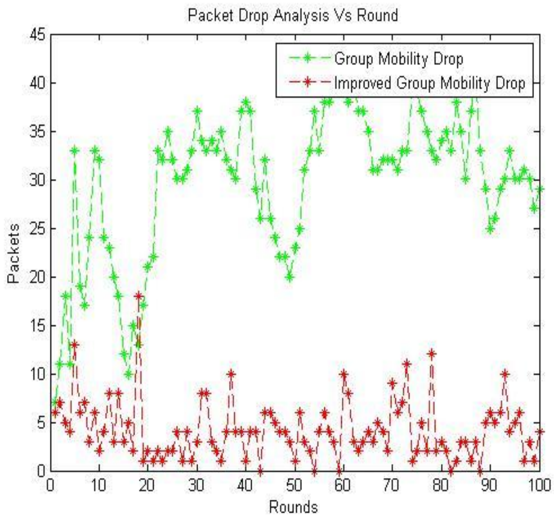

Figure 2 Packet Drop

c. Node Handoff Count: If the packet drop is greater than 3 packets and less than 4 packets during transmission after shifting of nodes, then the node which gets disconnected from the group is merged into the nearest group after calculating its distance with all group heads. Each time when this operation is performed, the value of Node Handoff Count is incremented. Figure 3 shows Node Handoffs with respect to Rounds.

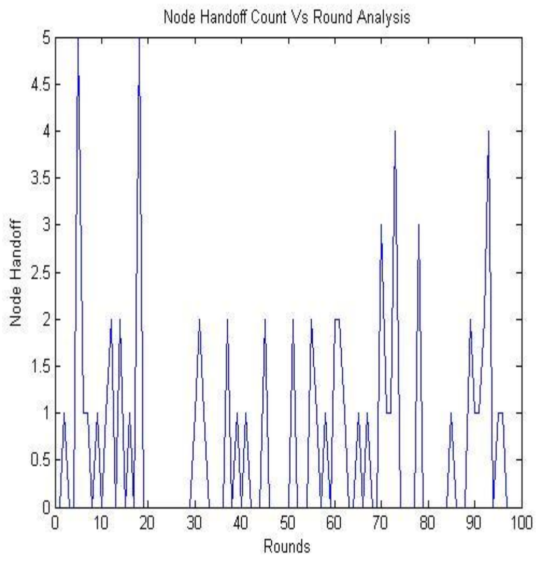

Figure 3 Node Handoff Count

d. ***Group Head Switch Count:*** If the packet drop is greater than 5 packets during transmission after shifting of nodes, then the entire group member distance is calculated again to find the new group head. Now the new group head is elected which has maximum number of coverage of nodes. Each time when this operation is performed, the value of Group Head Switch Count is incremented. Figure 4 shows Group Head Switch with respect to Rounds.

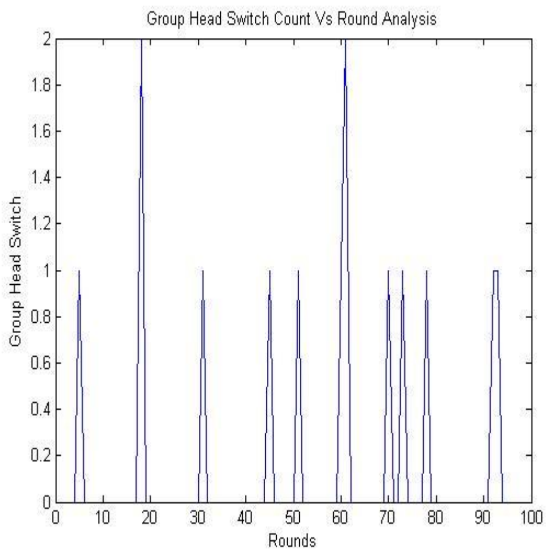

Figure 4 Group Head Switch Count

e. ***Group Handoff Count:*** After shifting (mobility) of nodes, if Group Heads of Groups move from their own region to other region, then the Group Head which get disconnected from their own region is connected to the other region which has the shortest distance to the Group Head. Each time when this operation is performed, the value of Group Handoff Count is incremented. Figure 5 shows Group Handoffs with respect to Rounds.

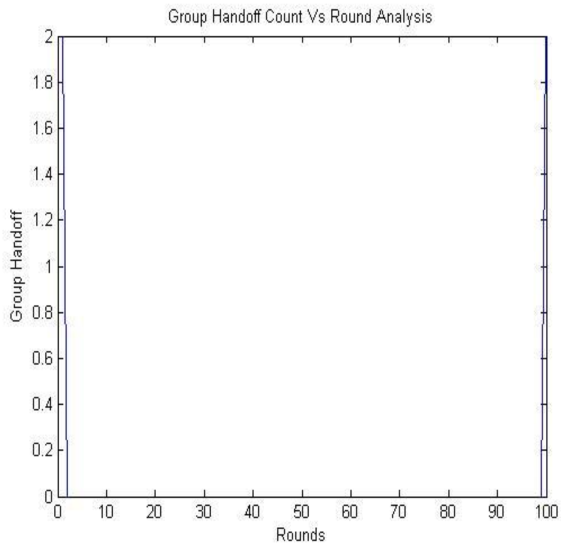

Figure 5 Group Handoff Count

f. ***Group in Regions Count:*** After Group formation, the distance of Group Heads is measured to regions. The

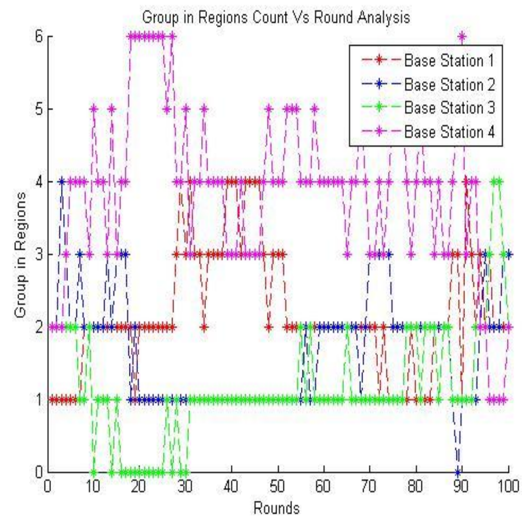

Figure 6 Groups in Regions Count

Region that has the shortest distance to the Group Head becomes the region of that Group. Each time when this operation is performed, the value of Group in Regions Count is incremented for that particular region. Figure 6 shows Group in Regions with respect to Rounds

VII. CONCLUSION AND FUTURE SCOPE

Various parameters like packet transmission, packet drop and handoffs are used for analyzing the simulated result of proposed scheme of Group Mobility for HWN with Packet loss minimization as compared to Efficient Group Mobility Scheme in HWN using MATLAB simulator. There is a reduction in the packet loss and step up in the packet transmission. Thus Group Mobility for Heterogeneous Wireless Networks with Packet loss minimization tackled the problems of

a. Disconnected nodes from Gateway node after mobility
b. Gateway node failure
c. Selection of new Gateway node after existing Gateway node failure

With removal of these problems, it automatically minimized the packet loss in group mobile environment.

Mobility management in heterogeneous networks is a complex problem comprising of a large number of challenging issues. The QoS (Quality of Service), security and authentication issues may be considered in future. The network selection is vital in future highly integrated pervasive HWN environment. A traditional way to select a target network is on the received signal strength; it is not effective enough to make the best choice for the multimedia applications. Cost function based handoff decision algorithm is used to select network with minimum cost function value for handoff.

There is a need of evaluating these techniques in a more realistic scenario and applying them to actual wireless scenario.

VIII. REFERENCES

[1]. Traynor, Patrick, et al. "Efficient group mobility for heterogeneous sensor networks." Vehicular Technology Conference, 2006. VTC-2006 Fall. 2006 IEEE 64th. IEEE, 2006.

[2]. Cano, J-C., and Pietro Manzoni. "Group mobility impact over TCP and CBR traffic in Mobile Ad Hoc Networks." Parallel, Distributed and Network-Based Processing, 2004. Proceedings. 12th Euromicro Conference on. IEEE, 2004.

[3]. K. Egevang and P. Francis. RFC 1631 - The IP Network Address Translator. http://www.ietf.org/rfc/rfc1631.txt, 1994.

[4]. Yusof, Azita Laily, Mahamod Ismail, and Norbahiah Misran. "Traffic Driven Handoff Management Scheme for Next Generation Cellular Networks (NGCN)."Computer and Network Technology (ICCNT), 2010 Second International Conference on. IEEE, 2010.

[5]. Kim, Dongwook, Mrinalini Sawhney, and Hyunsoo Yoon. "An effective traffic management scheme using adaptive handover time in next-generation cellular networks." International Journal of Network Management 17.2 (2007): 139-154.

[6]. Kim, Dongwook, Namgi Kim, and Hyunsoo Yoon. "Adaptive Handoff Algorithms for dynamic traffic load distribution in 4G mobile networks." Advanced Communication Technology, 2005, ICACT 2005. The 7th International Conference on. Vol. 2. IEEE, 2005.

[7]. Selvakumar, A., V. Vaidehi, and T. G. Palanivelu. "Adaptive load balancing handoff scheme for heterogeneous wireless network." Advanced Computing (ICoAC), 2011 Third International Conference on. IEEE, 2011.

[8]. Kassar, Meriem, Brigitte Kervella, and Guy Pujolle. "An overview of vertical handover decision strategies in heterogeneous wireless networks." Computer Communications 31.10 (2008): 2607-2620.

[9]. Kennemann, Olrik. "Pattern recognition by hidden markov models for supporting handover decisions in the GSM system." Proc. 6th Nordic Seminar Dig. Mobile Radio Comm. 1994.

[10]. Wong, Daniel, and D. Cox. "A handoff algorithm using pattern recognition."Universal Personal Communications, 1998. ICUPC'98. IEEE 1998 International Conference on. Vol. 1. IEEE, 1998.

[11]. Namee, Khanista, and Nigel Linge. "A framework of multicast mobility in heterogeneous networks." Proc. The 11th Annual Postgraduate Symposium on the Convergence of Telecommunication, Networking and Broadcasting (PgNet2010). 2010.

[12]. Yang, Kemeng, Bin Qiu, and Laurence S. Dooley. "Using SINR as vertical handoff criteria in multimedia wireless networks." Multimedia and Expo, 2007 IEEE International Conference on. IEEE, 2007.

[13]. Zahran, Ahmed H., Ben Liang, and Aladdin Saleh. "Signal threshold adaptation for vertical handoff in heterogeneous wireless networks." Mobile Networks and Applications 11.4 (2006): 625-640.

[14]. Cristache, Gabriel, et al. "Aspects for the integration of ad-hoc and cellular networks." 3rd Scandinavian Workshop on Wireless Ad-hoc Networks, Stockholm. 2003.

[15]. J. McNair and F. Zhu, "Vertical Handoffs In Fourth-Generation Multinetworks Environments", IEEE Wireless Communications, June 2004.

[16]. Chen, Wen-Tsuen, and Po-Yu Chen. "Group mobility management in wireless ad hoc networks." Vehicular Technology Conference, 2003. VTC 2003-Fall. 2003 IEEE 58th. Vol. 4. IEEE, 2003.

[17]. G. Pei, M. Gerla, X. Hong, and C. Chiang. A Wireless Hierarchical Routing Protocol with Group Mobility (WHIRL). In Proceedings of theIEEE Wireless Communications and Networking Conference, 1999.