A Smart Booster Approach In Wireless Ad Hoc Network

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Abstract— **Wireless Mobile Ad-hoc network is upcoming next generation technology. The foremost reason to be the popularity of MANET is its infrastructure less nature. MANET is a group of wireless mobile nodes which are connected wirelessly. Nodes may be highly mobile because the beauty of wireless network (like MANET or cellular system) lies in mobility. But due to this mobility of nodes, the topology of the node and network changed frequently. This frequent change topology affect to the communication between nodes. If nodes are within the range of each other they can communicate properly but if nodes are not in the range of each other, communication will not be possible smoothly or even ongoing communication may be disrupt or lost. So there is a need to develop and design a mechanism or system that can handle such types of situation and prevent communication failure or frequent link failure. In the present work a novel booster mechanism approach is proposed to overcome such situation or Link failure. In the proposed Approach, the level of the Power at both the Transmitter as well as Receiver is measured in order to maintain communication smooth between the nodes. If one node is moving away from the communicating node then both moving node will measure its receiving power with respect to the distance and if its current power level reaches the threshold level it switched "ON" its Booster and at the same time it send a message to source node which contains received power level of moving node due to this ,that source node also "ON" its Booster and thus both nodes connect together to protect the link failure during that mobility. The Booster Approach is a novel concept in the direction of smooth communication in dynamic or wireless environment in Mobile Ad hoc Network.**

Keyword- MANET, Node, Booster, Tx power level , Rx Power level

I. INTRODUCTION

Mobile Adhoc Network is a wireless multihop, self organizing, and infrastructure less future technology. MANET has lot of application like in sensor network, tactical network, home network, emergency network and vehicle network etc.Though much progress has been done in MANET but there are still, various issues/challenges like dynamic topology, security, Node Mobility, limited battery backup ,limited bandwidth and Routing Protocols . In adhoc network the communication take place with mobile nodes and hence at the time of communication node which is mobile may be goes out from the network premises and communication may be disrupt or lost because of link failure between those communicating nodes [2][3]. The mobile environment also produces the significant challenges in the communication between nodes. Because the nature of nodes is mobile all the time, battery consumption is more which affect to the communication link and stability to the network which should be maintain properly during mobility. The presented proposed approach prevents communication failure or loss during node mobility. In the propose novel Booster Technique, a Booster is a smart device which works automatically with the help of some algorithm. It will check threshold level of node's Tx and Rx power level and distance between Transmitter and Receiver. In case if mobile nodes are losing range of each other at the time of ongoing communication, the algorithm "ON" the booster. After the activation of booster the mobile nodes can carry their ongoing communication without link failure. The Booster Approach may be very helpful in mobile and hostile wireless Ad hoc Network.

II. RELATED WORK

A mobile adhoc network is known as multihop network i.e. from the source to destination the communication is take place with the help of intermediate nodes. The technique which decide route from source to destination in mobile adhoc network is called routing protocol. Due to the mobility of nodes, the topology of the network change frequently, hence route between nodes also changed. Routing is one of the major challenges in MANET [9]. Routing protocols [7] support maximum reliability by selecting a route if a node fails or leave the network. It route network traffic through the path with least cost in the network by minimizing the actual length between source and destination through and provide the best possible throughput path and delay. Routing in MANET can be classified in many ways [9] such as proactive and reactive. Proactive routing protocol maintains route continuously within the network even there is no communication in the network .Proactive routing is good for small cluster[11}.On other side reactive protocol establish route on demand basis [8] and convenient way for

managing large network[12]. So The algorithm which divides large network into small network is called clustering. Clustering scheme has one backbone node which is called Cluster Head (CH) [18] .CH is responsible to the smooth communication in the cluster.

III. PROPOSED APPROACH

In the proposed smart booster approach, assuming that each node in Mobile Adhoc Network is booster enabled, a threshold value is used to activate and deactivate the booster. The threshold value is related to strength of signal below which communication between two nodes may be lost or fail. All the nodes in the cluster send the performance table to the cluster head (CH) as shown in Fig.1. On the basis of efficiency the CH assign the task to the nodes in the cluster. If any node goes out from the cluster and receiving a low signal (equivalent to link failed) as shown in Fig.4., then outgoing node checks the value of signal strength, if signal strength is less than threshold value then booster becomes active, the booster amplifies the signal, the node which is connected to outgoing node also activate its booster . The proposed approach is good particularly for reliable communication in the cluster or outside the cluster. Using booster technique overall performance may be increased.

IV. PROBLEM DEFINITION

In Mobile Adhoc Network node speed cannot be restrict i.e they are free to move anywhere. In the proposed approach cluster Head (CH) attempts to tie up with cluster member node within its cluster, through the use of booster mechanism. So in the proposed model we developed a mechanism for booster RF approach.

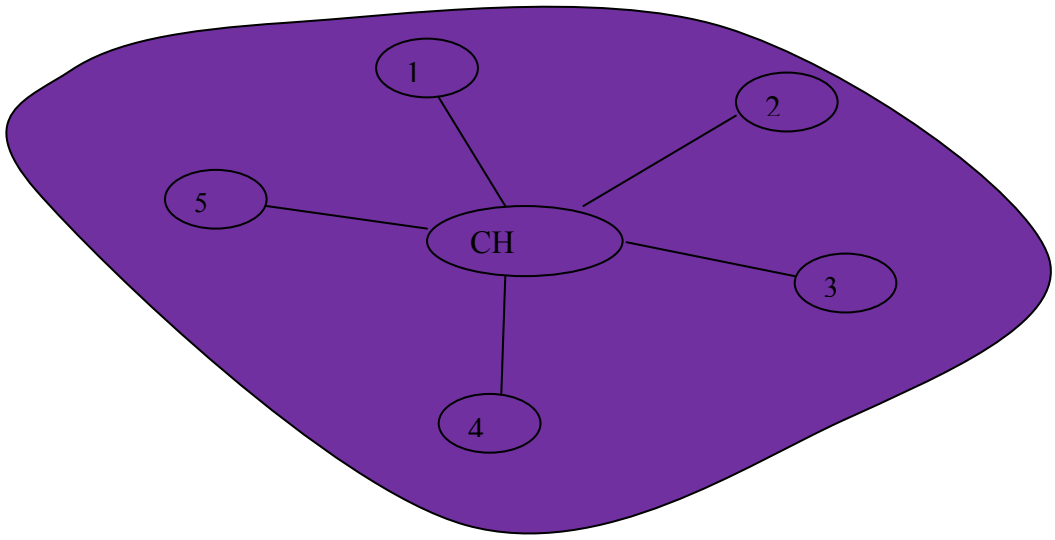

Fig.1. Node2 is moving out of the CH range

In proposed method three metric parameters are taken into consideration.

1. Distance between communicating node
2. Tx Power level
3. Threshold level (Rx power level)

According to Friis free equation as shown in equation (1)

$$p_r = \frac{p_t G_t G_r \lambda^2}{(4\pi)^2 d^2} \quad \text{.....} \quad \text{.....} \quad (1)$$

In ad hoc wireless communication a single hop (The max.250m distance between two nodes) ,By analysing the table 1 and table 2,we observe that as distance increase Tx power level increase while Rx power level decrease.

TABLE 1. TRANSMISSION POWER AND CORRESPONDING TRANSMISSION RANGE OF A NODE

Transmission Power (dB)	Distance (m)	power level
20.50	50	1
25.82	100	2
38.15	150	3
45.51	200	4
50.00	250	5

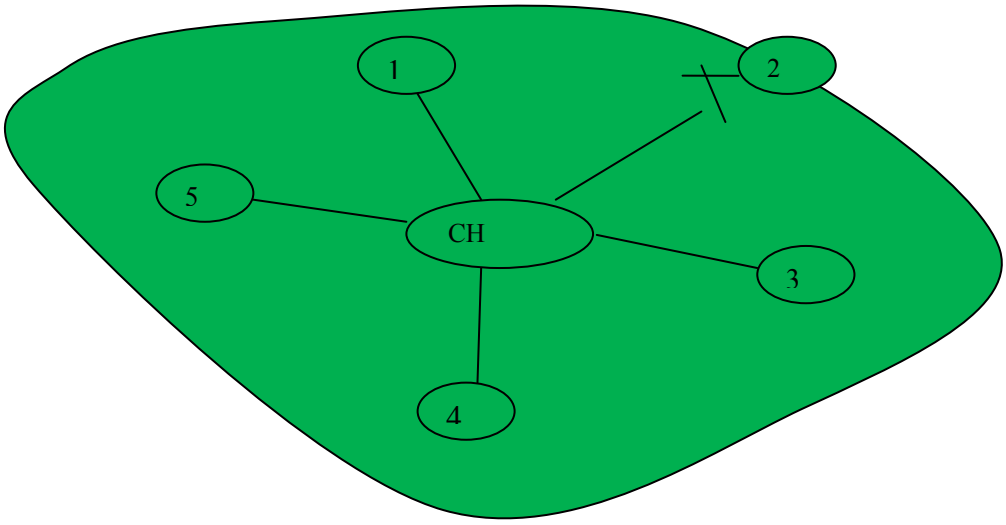

Fig.4. link failure between node CH and node 2

Table 2. *RECEIVE POWER AND CORRESPONDING DISTANCE*

Receive Power (Threshold Level) (dbm)	Distance (m)	Power level
-90	50	1
-92	100	2
-95	150	3
-98	200	4
-100	250	5

In Fig.1. There are 5 nodes. Cluster Head(CH) is communicating to node 2.At the same time node2 is moving away from the node CH, due to this mobility the communication link between node CH and node2 break and the ongoing communication can be disrupt or fail as shown in Fig 4. To prevent this link failure or communication, we have to increase the Power (Strength) level of both nodes with the help of smart booster Mechanism. In the proposed approach, the Power levels at both the nodes (Tx & Rx) is increased in order to maintain communication between communicating nodes in the network Before switching "ON" the booster, the power level of the node is measure with the help of Message packet(MEP). MEP packets Exchange the data between nodes including Rx power level. After comparing the power level with threshold power level which is required for smooth communication between two intend nodes and if current Rx power level reaches the Threshold level they will activate their booster respectively.

V. RESULT AND DISCUSSION

In the given Fig.1 node 2 is moving away far from node CH so as per the Tabl.3 if the distance increases between two nodes, Rx power level decreases. After a certain time if node2 Rx power level reaches at the threshold power level 100 dBm as shown in Fig.3. then its Booster activated automatically and at the same time node 2 send MEP packets to node CH,informing its Rx power level status to node CH.

As node CH receive this MEP packet its Booster will be automatically activated with the help of algorithm and both the nodes reconnect as shown in Fig.5.

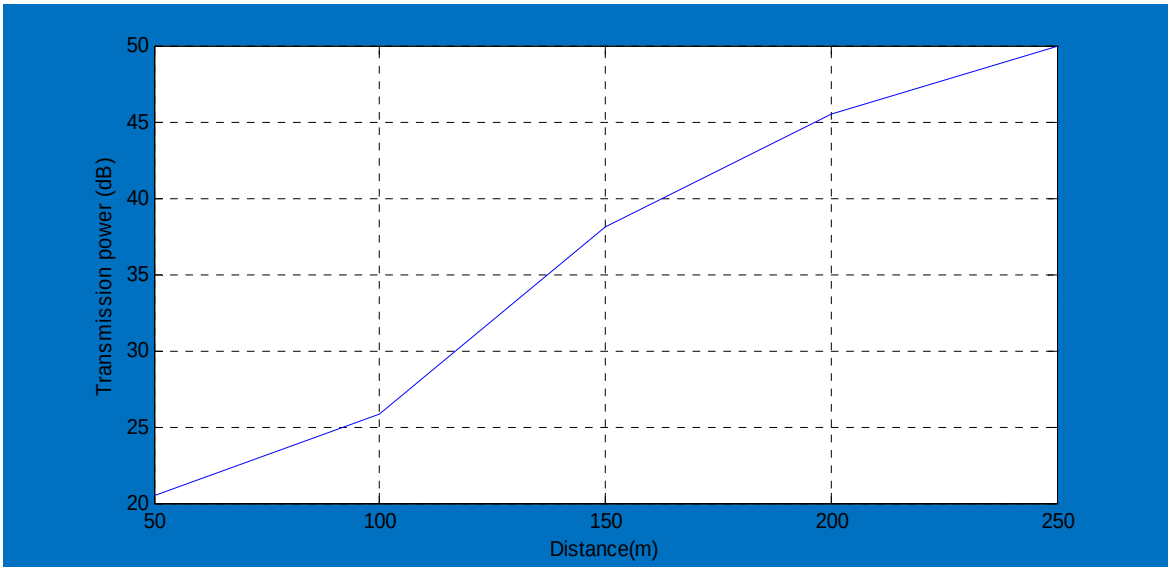

Fig.2. Transmission power Vs Distance

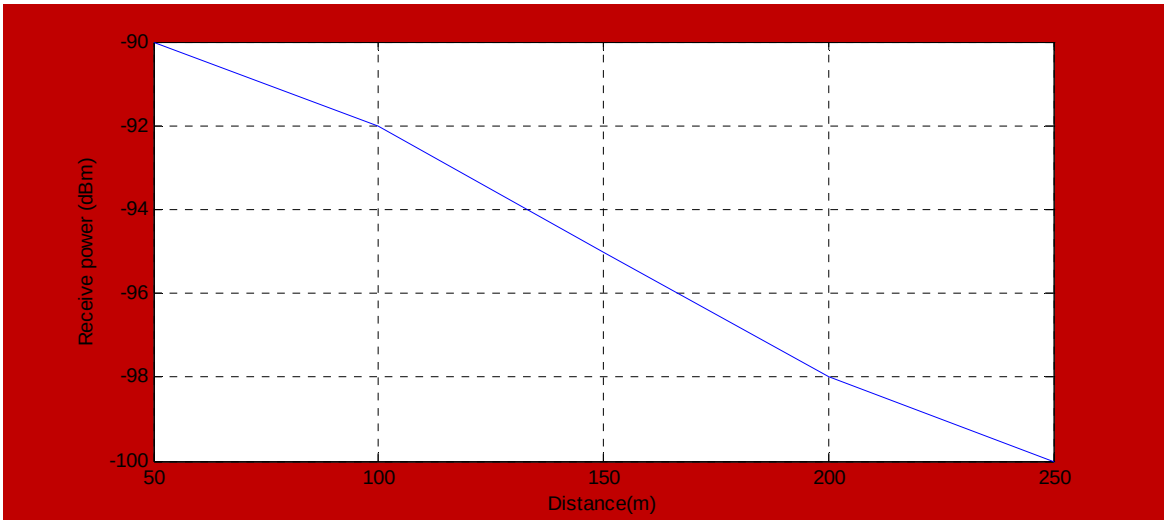

Fig. 3. Received power Vs Distance

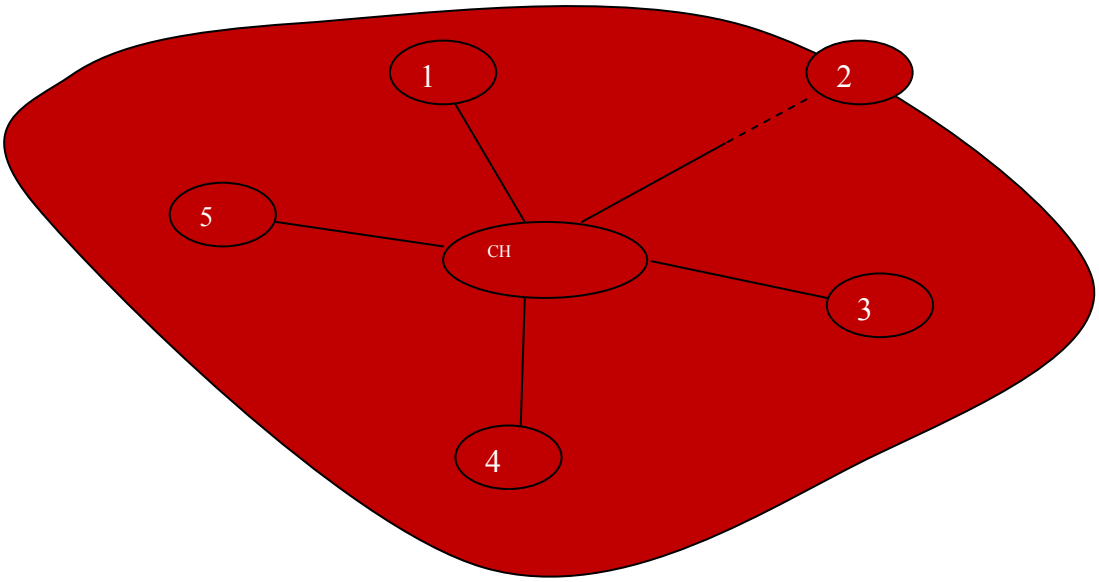

Fig. 5. Communication between CH and node2 after the Booster "ON"

VI. CONCLUSION/FUTURE WORK

In the proposed approach, the booster mechanism tie up two nodes to each other when communication is going on in the network or cluster by measuring Transmitter power level, Receiver power level and distance between the nodes. Hence proposed approach provides a good solution to tie up two mobile nodes which go out of each other range due to mobility and due to which ongoing communication lost in the network. Hence through the Booster mechanism approach, network efficiency, reliability and overall performance of the network is increased. The proposed is a new direction in the better communication in wireless mobile adhoc network. The future work may include designing of low weighted and less battery consumption enabled boosters and optimization of booster.

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REFRENCES

[1] C K Toh, Ad Hoc Mobile Wireless Networks, Prentice Hall Publishers, 2002.
[2] Z. Bojković, M. Stojanović, and B. Milovanović, "Current Developments towards the 4G Wireless System," Proceedings of International Conference TELSIKS, Niš, Serbia, September 2005, pp. 229-232.
[3] Haoya Tan; Hoi-Lun Nagan; Yunhuai Liu; Nionel, L.M., 2010.Measurement Study of Mobility-Induced Losses in IEEE 802.15.4. IEEE International Conference on Communications (ICC 2010). May 2010,pp.23-27
[4] H.Takagi and L. Kleinrock, Optimal transmission ranges for randomly distributed packet radio terminals.IEEE Trans. On Communication. vol. 32, no, 3, March 1984, pp.246-257.
[5] T.C Hou and V. O.K. Li, Transmission range control in multihop radio networks. Trans. On Communication. vol. 34, no.1, January 1986, pp.38-44.
[6] Al-Akaidi M.: Alchaita, M., Link Stability and mobility in adhoc wireless networks [J], IET Communication, Vol.1, No.2, April 2007, pp.173-178
[7] Ionis Nikolaidis, Michel Barbeau, Evangelos Krankis, Ad-hoc, and wireless Networks. Third International Conference, ADHOC_NOW 2004, Vol. 3158, Springer, 2004, pp. 651-660
[8] Jing Deng, Yunghsiang S. Han, Po-Ning Chen and Pramod K. Varsheny, Optimal Transmission Range for Wireless Ad Hoc Network Based on Energy Efficiency .IEEE Transaction on Communications. Vol.55, No.9, September 2007, 1439-1439
[9] Networks, IEEE Wireless Communication and Networking Conference, Vol.3 2000, pp. 227-232
[10] M.Abolhasan, B.Hagelstein, J.C.P Wang, Real world performance of current Proactive multi-hop mesh protocols.IEEE APCC, Shanghai 8-10th October 2009
[11] Neyre Tekbiyik,ElifUysal-Biyikoglu, Energy efficient wireless unicast routing alternatives for machine to machine networks, Journal of Network and Computer Application, Vol 34,2011, pp 1587-1614.
[12] V.Kaudia and P.R. Kumar, Power control and clustering in adhoc networks.IEEE INFOCOM, vol. 1, 2003.pp.459-469
[13] S.Singh and C.S. Raghavendra, PAMAS: power aware multi-access protocol with singling for adhoc networks. Computer communication review, vol.28, No.3, 1998, pp. 5-26
[14] Jones CE, Siva lingam KM, Agrawal P, and Chen JC, A survey of energy efficient networks protocols for wireless networks. Wireless Networks, Vol.7.No.4, 2001, pp. 343- 358
[15] Henry Kumagi. "Wireless Networking Security Consideration", published in Lasa Knowledgebase.
[16] Baker, D.J. & Ephremides, A. The Architectural organization of a mobile radio network v ia a distributed algorithm. IEEE transactions on communications COM- (1981. pp.1694-1701

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Anzar Ahamd is presently working as an Associate Professor in the department of Electronics & Communication Engineering at the Graphic Era University, Dehradun, India. He did the Bachelor of Engineering (Electronics & Communication Engg) degree from Jamia Millia Islamia University New Delhi 1995. He did M. Tech (Microwave and optical Communication) from RVD University, Rajasthan and PhD(submitted) on Mobile adhoc network from the Graphic Era University, Dehradun. He has worked as a co-supervisor on a project title," Scheduling Algorithm for Tactical Multi-hop Mobile Ad-hoc Network" funded by DEAL (Defence Electronics Application Lab), Dehradun. He has published 19 research papers in various reputed national and international Journals/conferences. He has worked in India as a faculty member for around 18 years and has taught several core subjects in M.Tech as well as in B.Tech like Wireless communication, Telecommunication Switching, Data Communication Network, CDMA system. His research area is Mobile Adhoc Network (MANET) and Wireless Communication. He has training on wireless mobile communication system (GSM).