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Cluster Formation in Manet Using S/N Ratio of Channel Connecting Two Nodes.

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The configuration of mobile ad hoc networks (MANETs) is constantly changing. The attacks by malicious nodes or any faults in network hardware or software directly affects the network resources specially Bandwidth. This affects network performance. It is proposed a cluster scheme purely based on bands of S/N ratio .

Key Words
S/N ratio, migration, Cluster Head

The concept:
Here an area to be serviced divided into regular shaped cells. Each of these cells is assigned a range of S/N ratio band. The same S/N ratio band cannot be used in other cells. Here each node align itself different clusters. As the nodes move around, they would change from cluster to cluster .The nodes can find out which cluster is governed by what S/N ratio band... When they did not receive a signal from any of the nodes in a cluster, they would try other clusters until they found one.
Effect of faulty nodes is waste of Bandwidth..

1. Introduction

Bandwidth is a limited resource in MANETs. To prevent unnecessary allocation of Bandwidth for non performing nodes we have deviced an algorithm for the prevention of wastage of Network bandwidth **.**
The cluster formation: Every group of node is formed together and the arranged in one Group. The main purpose of cluster formation is the reduce the transfer Rate which will reduce propagation delay and bandwidth consumption. For the formation of clusters various criteria have been developed.

Here I am using Cluster making algorithm based on S/N ratio
per cluster we have to limit the number of members.

S/N ratio= Power of Signal in the channel connecting two nodes/Power of noise in the channel connecting two nodes.

S/N in dB = 20 Log S/N ratio.

We will be using Cluster making algorithm based on S/N ratio .Here we assume a Mannet as a network distributed over land areas called Clusters , each hypothetically controlled by by at least one fixed-location Cluster head (base station).When joined together these clusters provide radio coverage over a wide geographic area. This enables a large number of nodes to communicate with each other and with fixed cluster heads anywhere in the network, via cluster heads, even if some of the nodes are moving through more than one cluster l during operation...

This will offer a number of advantages over alternative solutions:

- increased capacity
- reduced power use
- larger coverage area
- reduced interference from other signals

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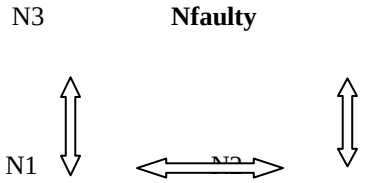
Principle: The communication between any nodes in Manets is very much noise affected and hence the S/N ration comes in to play. Hence there will be different S/N ratios for different pair of nodes. We propose a clustering scheme between nodes having S/N ratio in a band and the nodes having heighest S/N will be selected as Cluster heads1 and 2 .
2. In our system nodes organize in clusters only difference between clusters is S/N ratio band. Clusters we propose here are very similar to Cells in mobile telephony. Nodes with failures will have extremely low S/N ratios with any o
These nodes. (Literally zero).The malicious nodes will constantly prey on victim nodes and constantly changing hence will have constantly changing S/N ratios. This will be detected with algorithm... **3**

Evolution of clusters:

When two nodes in Manets communicate they will search simultaneously search for neighboring nodes. They notify if any such nods and the S/N ratio of their respective channels.



From Node	To Node	S/N ratio	Compare if they fall in a narrow band, €
N1	N2	Db(n1n2)	
N1	N3	Db(n1n3)	Is Db(n1n2)- Db(n1n3)< €1
N2	N4	Db(n2n4)	Db(n2n4)- Db(n1n3)< €1
N2	N5	Db(n2n5)	Db(n2n5)- Db(n1n3)< €1
N2	Nfaulty	Db(n2nf)	Db(n2nf)> €1
N2	Nx(a genuine node but constantly changing its location and hence its Db)	Dbx=Will wait for a suitable cluster with its Db fits in.	The performance of this node may not be effective or useful to the overall network performance.

For cluster 2 another band €2 is defined.Simillarly for other clusters different bands can be selected. Say €1=10 dB,€2=15dB,€3=20dB.
N1,N2,N3,N4…..NT be the nodes,
Let Db(nanb) be the S/N ratio between two pairs of nodes a and b.
Hence Db (n1n2), Db (n1n3), Db (n2n4), between nodes N1, N2 etc.

.Let Db (n2nf) be S/N ratio from N2 to faulty, Let Db (n2nNe) be S/N ratio from N2 to Non efficient malicious node. Let Dab be S/N ratio of a constantly changing node. The node having dynamically varying S/N ratio will ultimately settle in one or the other cluster. i.e. Dbx=Will wait for a suitable cluster with its Db fits in.

1. Calculate S/N for each pair of nodes.

2. Assign pair of nodes having S/N in a band €1 in a

Cluster K1.Assign other nodes with same band to same cluster till total number of nodes in a cluster is less than or equal to 'L'.Similarly assign pair of nodes having S/N in a band €2 in a cluster K2.

3.Suppose a node Ng fits in both clusters say K1 and K2 but with different other nodes say Nh and Ni. Then the first calculation will be taken in to account.

4. What if a node falls into band €1 and the clusterK1 is already populated. (ie more than 'L' maximum limit).It will form a standalone Cluster. And whenever there is a vacancy it will fit in. As it will be assigned seniority malicious nodes cannot enter the vacancy easily.

5. What if a node does not fall into any clusters. Then also it will form a standalone Cluster. And whenever there is a S/N match it will fit in. As it will be assigned seniority malicious nodes cannot enter the vacancy easily.

6. The first two nodes will be assigned cluster head1 and cluster head2.They will assign management of network resources. Hence malicious node has to enter and form a cluster instantly in order to head such a cluster which is a remote possibility. Because it has to first establish a communication with network and by that time the elapsed time for cluster making will fulfill.

Previous work: Cluster head selection based on heighest degree:It is based on the number of neighborhood nodes a particular node is having around.

Whenevr the election procedure is needed the node broadcast their identifier which is assumed to be unique in the same network. According to the number received identifiedr (ID) of every node compuetes it degree .One having maximum degree becomes the cluster head.This algorithm fails because ther degree of the node changes very frequently. The cluster heada are unlikely to play their role for a long time . This may affect stability in cluster management .

The Lowest load principle also known as Identifier based node selection.It is better than the heighest degree in terms of throughput. Major drawback of this algorithm is the smallest ID's which may lead to batter drainage of certain nodes.

Migration from one cluster to another and node alignment

When a node is moved away from a first cluster and closer to a second cluster, the node listens to channels and switches itself to another cluster. The new cluster automatically selects the node which will align to it only if there is a vacancy. The migrated node automatically switches from the current cluster to the new cluster and communication continues.If theire is no vacancy it will form a standalone cluster.If there is a message not completely sent by migrating node it simultaneously moves to new cluster at the same time and sends the remaining part of the message with the strongest signal.

Effect of migration on cluster stability and management:

The effect of migration of nodes is having two effects on cluster.

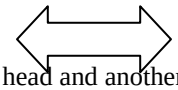
1. On the stability of clusters: The nature of AdHoc network it itself is constantly changing. Hence any scheme is bound to have this limitation.Here migration is not dependent on physical distance but on the stengngth ogf the channel between migrating node and member nodes in a cluster.
2. On the Cluster head: The mannets are continuously evolving. Hence if a cluster head1 itself migrates the cluster head 2 will take over.

   Here it is inherent that the cluster Heads should have more network resources and battery power. If Cluster head 1 finds that it is running out of battery or memory than it recluses itself from heading the cluster and braodcast a message of Cluster head2 taking over.
3.
4. Meanwhile Cluster head broadcasts a message about the Cluster head 2 taking over.
5. Range of dBs:

Say: range of dBs

i. 5-15 db
ii. 20-30 dB
iii. 35-45 dB
iv. 40-50 dB
v. 55-65 dB

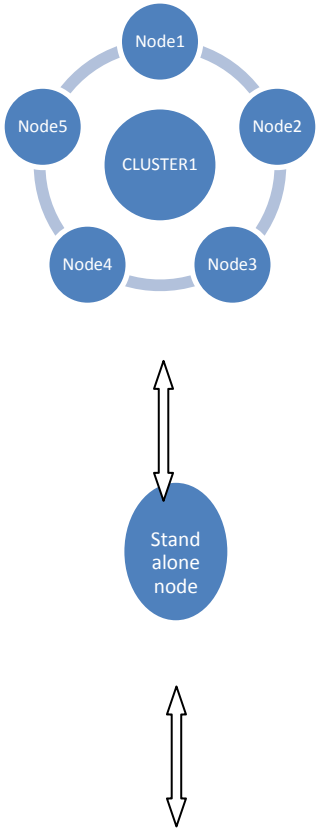
1. First any two nodes will establish communication and their channel S/n may be anywhere in above ranges.

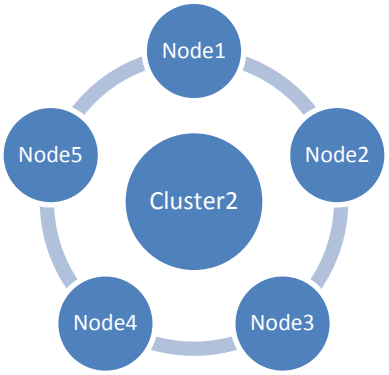
A B 

One of them will be Cluster head and another is sub cluster head for the cluster formulating subsequently.

2. Maximum number of nodes in a cluster is to be limited for the sake of cluster management. Say maximum 5 nodes in a cluster.

So if more more than 5 nodes fall in a band of cluster first five will form a cluster. The sixth will be a stand alone cluster connected to the earlier cluster.





3. What if a node is having an in-between dB range say 17 dB.

   It is connected to some member of a cluster already formed and it will form a standalone node.

4. Standalone nodes although increase cluster overhead but they may form a connection in between clusters of two different dB range.
5. Network overhead wrt number of clusters.

   Suppose n is even saying 10. The number of clusters formed is limited by closeness of db ranges.

   Nodes are A,B,C,D,E,F,G,H,I,J.

   Let us study propagation delay in sending a message from A to J.

   All are standalone nodes clusters, hence maximum 5 clusters

   AB-----CD-----EF-------GH-----IJ 4 Propagation delay

   3 Nodes in a cluster.

   ABC-------DEF------GHI-------J 3 pd

   ABC------DEF-----GH----IJ 3 pd

   ABC---------DE------FG----------IJ

   4 nodes in a cluster

   ABCD---------EFGH----------IJ 2 pd

   ABCD-----EFG-----HIJ 2 pd

   ABCD------EFG-----H----IJ

   ABCD------EF-----GH-----IJ---

   5 nodes in a cluster:

ABCDE------FGHIJ

Less propagation delay is possible when only number of nodes in a cluster is n/2. But we can not allow more than a certain number of nodes in a cluster.Hence cluster management overhead and propagation delay(parameter of QOS) to be suitably optimized. Number of clusters will be slowly formed when' n' is small. Cluster making is difficult. E.g. Ships of a naval force in an ocean.But with mannet having more nodes cluster will be evolved fast. There is a limitation in that probability of migration of nodes from one cluster to another is also high which will have an effect on cluster stability.

6. To increase better utilization of cluster resources we have to increase the number of nodes forming the cluster. For that we have to increase the dB band. Say we have

A -----B = 200 dB : A -----C = 20 dB

Now to include all these three we have to make a band of 10 -250 dB.

Suppose B is sending a message to C via A. In order to form a cluster it has to compromise with QOS from A to C.

We assume that anyway the communication have to be carried out and there is no alternate route from B to C we have to compromise this QOS.

5. Conclusion

Our current research work on cluster formation is in accordance with dynamic nature of mannets.It is prone to suffer from fault Occurrences in harsh environments because of constantly changing signal power.

6. Future Work

Following this conceptual framework we expect to Carry out simulations of the proposed clustering scheme Using network simulator NS-2. We would like to optimize network resources as we have assigned Cluster head 1 and Cluster head2 .

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