An Effective Communication Classification Approach to Improve VLeach Protocol

Khushboo Malik
Department of Electronics and Communications
Panipat Institute of Engineering and Technology, Panipat, India

Mr. K. K. Paliwal
Professor (ECE)
P.I.E.T , Panipat, India

Abstract-Clustering is an effective network construction and organizing approach in which complete network is divided in small area segments called clusters. Communication within the cluster is controlled by a controller called Cluster Head. In V Leach protocol, there are two CH in a cluster but only one CH is activated at one time. But in this paper, we have defined an improved VLeach Protocol in which both CH will remain activated always over the network. First CH is called Main CH that will be responsible for communication with range specific high energy nodes with single hop communication. Secondary Cluster Head is called SCH is responsible for communication with low energy nodes with multihop communication. The work is also performed to improve the cluster head selection approach. The obtained results shows that the presented work has improved the network communication as well as network life.

Keywords-VLeach,ClusterHead,Low-Energy,SCH, MainCH.

I. INTRODUCTION

A sensor network is a network defined with energy nodes. Sensor network is having its importance in many application areas such as vehicular network, body area network is defined under the energy constraints. The nodes are defined with some initial energy and with each communication some energy is lost based on the role of that node placement and the network life. Node placement is about the network localization, according to which an intelligent decision is taken regarding the location of nodes over the network so that effective communication will be performed between the nodes [1] [2]. The network is also having a main controller node called base station. The base station is responsible to handle the network communication as well as establish a communication link between the network nodes and the outer environment. Localization also includes the placement of base station over the network. The localization is more challenging according to the real time application area. According to this specification, network nodes can be static or mobile [3][4].

The network is defined under the positional constraints. Another important aspect is related to the network architecture. Network architecture is based on the type of physical network as well as based on the communication constraints [5][6]. The most adapted network architecture is the clustered architecture. The example of clustered architecture is shown in figure 1.
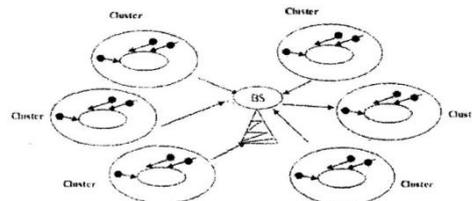

Figure 1: Clustered Architecture

According to this architecture, the complete network area is divided logically in small segments called clusters. Each cluster is controlled by a controller node called cluster head. The cluster head is defined
with some range specification. The nodes defined in the cluster head range are called cluster member.
To control the communication under this clustering architecture, some protocol is required.One of such protocol is Leach protocol [7][8]. This protocol is responsible to perform the cluster head selection and the cluster formation. It is also responsible to handle the inter cluster and intra cluster communication over the network. Each cluster member can communicate directly with cluster head and the cluster head communicate with base station. Leach protocol provides the effective communication, improved fault tolerance and reduced congestion over the network. This network architecture is also effective to provide the network reliability.

One of the important works of leach protocol is to perform the cluster head selection under different parameters including the energy, distance and residual energy based analysis. This selection criteria and communication mechanism is upgraded by various authors in existing leach protocol. Some of these improved Leach forms are VLeach, MLeach, N

Leach protocol. The VLeach protocol is such a protocol in which each cluster head is defined with two cluster heads called main cluster head and secondary cluster head. If the main cluster head dies, it is replaced immediately by the secondary cluster head.

In this paper, a significant improvement over the existing V Leach protocol is performed with improved cluster selection and communication mechanism. In this section, the brief introduction is given on the sensor network architecture and the protocol. In section II, the existing work related to the clustering protocols and communication is defined. In section III, a brief introduction to the Vleach protocol is defined. In section IV, the proposed improved V Leach protocol is described along with algorithm. In section V, the results as obtained from the work are presented. In section VI, the conclusion derived from the work is explained.

II.   EXISTING WORK

In this section, the research carried out by the researchers in the field of network architecture and the relative communication is described. The work also includes the study of different protocols. Macro Conti [1] discussed the sensor under different communication aspects such as energy resources, localization, transmission cost and the communication capabilities. The Network was formed to improve the network life and the life of network nodes. The work showed an improvement in the network life and the throughput by reducing the maintenance and the overheads. Author defined the synchronized protocol so that the overheads involved in establishing the communication will be reduced and the effective communication will be drawn over the network. Shelby [6] presents an agent based network architecture to control the communication under the mobility network. The work includes the network lifetime improvement so that the packet delivery ratio will be improved and the effective communication will be performed. The work includes the data delivery ratio and the delay analysis. The work also includes maintaining low infrastructure communication so that effective communication will be drawn over the network. Carlos [4] proposed a task management and analysis based network architecture so that the effective task oriented lightweight communication network will be established. Author also improved the network effectiveness in terms of management protocol.
S. Venkatesan[2] presented a mobile network architecture so that the effective sink sensing will be performed and the energy effectiveness will be achieved under the cluster architecture. The important aspect of clustered network is to perform the routing scheduled queue so that effective path generation over the cluster will be performed. Ankit Jain [7] presented an improved performance mechanism to achieve the synchronized communication under the realistic clustering architecture. Author defined some realistic and optimum schemes so that effective communication will be achieved over the network. Miodrag[3] has described uniform point process under a square or disk region so that the probability of the boundary effective communication is performed so that the network throughput will be improved.

III.   VLEACH PROTOCOL

In this section, the VLeach protocol is defined along with its functionality and the evolution. In year 2000, W.R. Heinzeloman has defined a protocol, to control the sensor network under a clustering architecture, called leach Protocol. This protocol is able to perform the hierarchical communication and provide the energy effective communication under the defined architecture. Author has described the network under the traditional communication constraints specification so that the distance and energy Adaptive communication is performed. Author described the class structure analysis approach to perform the clustering so that the network load is distributed as well as network life time is improved. Author also reduced the redundant communication so that the energy problems over the network are reduced. Over the time, the problems in leach protocol were identified and relatively some changes in leach were performed and improved forms of leach were introduced by different authors. These improvements were focused on to provide more reliable and energy effective network so that network throughput is improved as well as balanced network with synchronized communication is achieved. The effectiveness of the clustering protocol is described under the following features.
1.   Adaptive and self configured cluster construction
2.   Controlled localization so that effective communication will be performed
3.   Energy Effective media access
4.   Application specific communication

V-Leach is the improved form of leach protocol which contains two cluster heads in a cluster called Main CH and Secondary CH. Here main CH is actually responsible for all kind of communication and till the Main CH is active Secondary CH remains idle. When the Main CH dies, it is replaced by SCH so that the communication does not stop even if the cluster head dies. It reduces the cluster reformation over the network so that network setup time is reduced and the efficiency and the reliability over the network is achieved. The basic network architecture of VLeach is shown in figure 2.
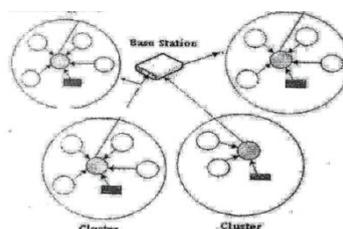

Figure 2: V Leach Architecture

IV. PROPOSED WORK

A wireless sensor network is having the limitation in terms of its energy constraint. With each communication over the network some energy is lost. One of the common sensor network architecture is clustered architecture in which the network is divided in small clusters and each cluster is controlled by a cluster head. In such networks, the cluster head selection is one of the major-challenge. The presented work is about to define a cluster head selection mechanism is a sensor network. In this work, each cluster will be defined by two cluster heads called Main and Secondary. The Main cluster head selection is performed parametrically on the basis of minimum distance, minimum connectivity and max. residual energy.

The Main cluster head will be responsible for the communication and to interact with base station. After the Main cluster head selection, secondary cluster head will be elected based on the maximum connected nodes at minimum distance ratio. The secondary cluster head accept the data from the low energy nodes by using an aggregative path and pass it to the main cluster head. The presented work includes both the direct clustered communication and multi-hop aggregate routing concepts to improve the network effectiveness and to save the energy. If the main cluster head will die new cluster head will be identified by same procedure, and relatively the secondary cluster head will be identified. The presented work will reduce the congestion over the main cluster head and improve the network life by saving the energy. The algorithm associated with the proposed work is given as under.

Improve VLeach()

{

Establish a sensor network under the physical boundaries with N Nodes and Base station placed at random position.

Initialize the Energy parameters for each node in term of initial energy, transmission energy etc.

For i=1 to N

[Process each node]
{

Collect the parameters for each node

Probability Constraint
Energy
Residual Energy
Distance

If (Energy (Node (i)>Threshold and

ProbabilityConstaint(Node(i)>Threshold)

{
For j=1 to N
[Check for the Cluster Members]
{

If (Node (j)='N' and

Distance (Node (i), Node (j) < Sensing Range)

{

Count=Count+1

}

}

If (Count>Threshold)

{

Set node (i)=MainCH

[Identify the Main Cluster Head]

MaxEnergy=0;

MinDistance=inf;

For j=1 to N

{
If (Energy (Node (j))>MaxEnergy and

Distance (MainCH,Node(j))<Min Distance)

{

P=j

}

}

Set Node (P) = SCH
[Set node as Secondary Cluster Head]

}

}

The effectiveness of the work is about to perform the communication between the Main CH and the high energy nodes directly and perform the communication between the SCH and the low energy nodes in multi hop path. Moreover, when the Main CH dies, it will be replaced by SCH. As both the cluster heads are activated all the time, the load over the Main cluster head will be shared and the network reliability will be improved because of the shared communication between CHs.

V. RESULT

In the present work, an improved VLeach protocol is presented so that an effective communication is performed over the network. The presented work is simulated in matlab environment with some network parameters. The network parameters are shown in table 1.

Table 1: Network Parameters [8]

Parameters	Values
Network Area	100x100
Number of Nodes	100
Initial Energy	1J
Transmission Energy	5 nJ
Receiving Energy	5 nJ
forwarding Energy	5 nJ
Number of Rounds	1000

The analysis of the work is done under two main parameters called, network life and packet communication.
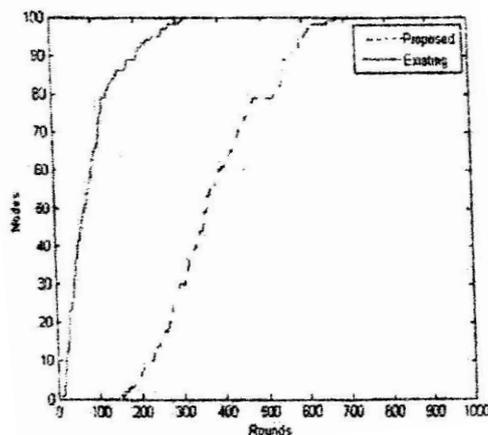
Figure 3: Dead Node Analysis (Existing Vs Proposed)

Here figure 3 is showing the network life analysis in terms of dead nodes. As we can see, in the existing approach, the whole network is dead upto 320 rounds whereas in proposed work, the network resides upto 700 rounds.
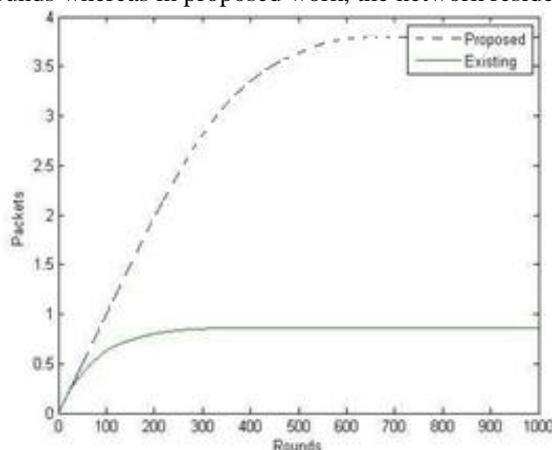

Figure 4: Packet Communication (Existing Vs. proposed)

Here figure 4 is showing the effectiveness of work in terms of packet communication over the network. The result shows that the presented work has improved the network communication.

VI. CONCLUSION

In this paper, an improved V Leach protocol is proposed in which both cluster heads remains activated all the time during communication. The Main CH is responsible for the direct communication with high energy nodes. The SCH is responsible for multihop communication with Low energy nodes. The result shows that the presented work has improved the network communication and network life by 74% & 44% respectively.

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