WSN-Fast IP Network Recovery with Maximation of Lifetime of Network

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***Abstract*—Wireless sensor networks contain small sensor nodes having small batteries. Sensors organize themselves dynamically in network. One of the major issue with WSN is consumption of energy which directly impact on lifetime of network. Also routing is one important protocol which consumes the energy in network. Here we propose scheme which maximize the lifetime of network subject to dynamic energy consumption model for each node with non ideal battery model. Also it deals with fast recovery from any failure occurs in network. Every node contains pre calculated set of configurations containing alternative paths. By these configurations we archive the global free re- routing**

***Index Terms*—Rerouting, sensor network, network recovery**

I. Introduction

In recent year's growth of wireless communication techniques are rapidly increases. So there is lot of advancement occurs in wireless sensor networks. Wireless sensor networks contains small sensor nodes which are battery powered, having computation and wireless communications capabilities. These sensor nodes are arranged randomly in networks. The energy consumption is major issue in wireless networks because it directly affects on lifetime of networks. The lifetime of these nodes is calculated by lifetime of batteries of these nodes. In this schema, we use non-ideal batteries to maximize lifetime of network in terms of random power consumption model for every node in network.

Also Routing is the most important protocol which utilizes the amount of energy in network. Thus Routing in wireless sensor network is ambitious task. This task may subject to quantity of routing protocols who utilize resources available at these sensor nodes. all these routing protocols must effort to search optimal energy paths. The quality of being able to perform the fast recovery from failure, here we propose Fast IP Network Recovery with maximize of lifetime of network for improving the capability of energy in Wireless Sensor Network. This schema is connectionless and consider only destination based node-by-node routing. It stores the additional information of routing in routers and route the data on alternative available paths immediately when any failure occurs in network.

Manuscript received July, 2015.
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II. Related Work

A.Sivasubramanian, et.al [1] explained how to increase the energy capability in WSN using scheduling techniques and routing. In scheduling technique, with fixed interval of time all the nodes will be in active mode or go to sleep mode. The proposed algorithm helps to decrease the use of energy by decreasing number of times. During a time period, node has to work in active mode. The main aim is to use energy efficient way.

Dr.Gomathy.C [2] gives energy sensible routing algorithm which is used for wireless sensor networks. Here Protocol is depends up on fuzzy logic which reduces energy consumption more as compared with other protocols . This Proposed protocol works in two models, First module finds neighbor node and modifying routing table and finding route is done in second module. Energy use is decreasing by proper protocol design implementation.

Nidhi Batra et.al [3] introduced the optimize routing protocol which deals with wastage of energy. One of new research area upcoming is its energy use which depends on wastage of energy of nodes. The shortest path energy efficient routing algorithm involves Medium Access Control protocol and also the routing protocols of wireless sensor networks. It also involves the ant- colony optimize concept for finding the shortest path from sender to receiver. Cost effectiveness is one of the main advantages of this algorithm..

Yuping et.al [4] introduced routing algorithm which is based energy efficiency for WSN. Here they make set of number of sensor network and allow them to work one after another. By this, activation of sensor is minimized and save the energy. Next time to select the node for routing data that time they taking into account the current energy of node with the distance of that node. So network energy consumption will be spreads among these sensor nodes. When network finds that it does not have nodes having enough energy then if automatically generates one more new set.

III. Proposed System

The proposed system is consists of three modules. In first module we create set of pre-deliberated routing paths conformation. By this every node is restricted from data routing in one conformation. In second module by routing algorithms generates conformation specific paths and update routing tables. Here we achieve loop free routing .The last

ISSN: 2278 – 1323

module is based on utilization of energy. Here routing process id developed which takes advantages of pre-deliberated conformations to achieve fast recovery from network failures.

The algorithm for generating the set of pre-deliberated routing paths conformation is as below.

Algorithm 1: Generating configuration

```
for  i  ε(1,2………Z) do
            Xi <- ( N, w0)
            Yi <- Φ
            Bi <- Xi
end
Qz <- λ
Ql <- Φ
i <- 1
while Qz ≠ Φ  do
    x <- first (Qz )
     j <- i
repeat
   if connect (Bi \ ( {x} , σ (x))) then
    Xt  <- isolated (Xi ,x)
  If Xt ≠ null then
     Xi <- Xt
      Yi <- Yi U {x}
     Bi <- Bi \ ({x}, σ (x))
     i <- (i mod z) +1
Until x ε Yi or i=j
If x ∉ Yi then
            abort
end
```

Here the above algorithm runs through all sensor nodes and isolate node one at time. The algorithm ends successfully when all the sensor nodes are isolated in one conformation or it find node that are not possible to isolate. Firstly z pre-deliberated routing paths conformation is created as normal conformation. The group of sensor nodes(Qz) and group of links (Ql) are initiated. Initially the link queue is empty. By using "first" method we get first node from queue and remove it from group. When the node x is try to isolate in a pre-deliberated conformation (Xi) , it firstly check that by this it will not break (Yi). This is decided by the "connect" method by checking each of x's neighbors can communicate each other excluding x which is isolated sensor node or isolated link in the (Xi). If the node x is isolated successfully, we test for next node, otherwise we continue to isolate node x in each conformation till the whole z conformations are tested. So by this algorithm we get a whole set of valid pre-deliberated routing paths conformation.

Now by using the shortest path algorithm in every conformation, we generate config specific routing table. Here we describe how these tables use to escape the failed node.

The Figure shows the steps that are taken in a node's forwarding process. First, packets that are not affected by the failure, are forwarded as normal (step 2). Special measures are only taken for packets that would normally be forwarded through a broken interface. In step 3, packets that are already routed according to a backup configuration, i.e., they have been marked with a backup configuration identifier by another node, are discarded. Reaching a point of failure for the second time, means either that the egress node has failed, or the network contains multiple failed elements.

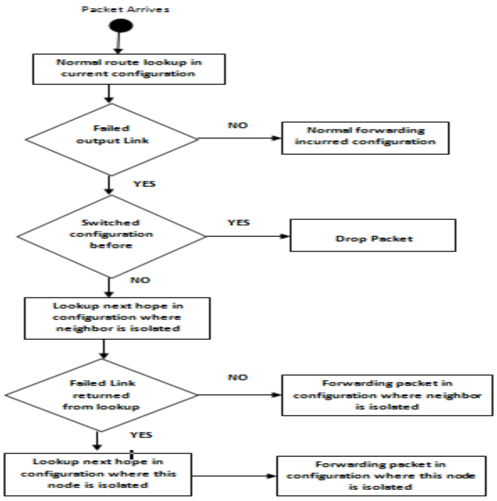

Fig. 1.State Diagram for a node's packet forwarding

To avoid looping between configurations, a packet is allowed to switch configuration only once. A separate mechanism would then be needed to keep packets from looping between two configurations, e.g. only allowing packets to be switched to a configuration with a higher ID. We then make a next hop lookup in the configuration where the neighbor is isolated, in step 4. If the same broken link is not returned from this lookup, we mark the packet with the correct configuration identifier, and forward the packet in this configuration (step 5). The packet is then guaranteed to reach its egress node, without being routed through the point of failure again. Only if the neighbor is the egress node for the packet, and the neighbor is indeed dead, will the packet reach a dead interface for the second time (in a single failure scenario). It will then be discarded in another node. If, however, the dead link is returned from the lookup in the configuration where the neighbor is isolated, we know that the neighbor node must be the egress node for the packet, since packets are never routed through an isolated node. In this case ,a lookup in the configuration where the detecting node itself is isolated must be made (step 6). Remember that a link is always isolated in the same configuration as one of its attached nodes. Hence, the dead link can never be returned from this lookup. Again, if the neighbor (egress) node is indeed dead, the packet will be discarded in another node upon reaching a dead interface for the second time.

IV. EXPERIMENTAL SETUP

This system is developed by using Java (JDK 8) language and NetBeans development tool on Windows OS. Any available standard system can run this application. In addition for this application is that network connectivity is required for sending data packets.

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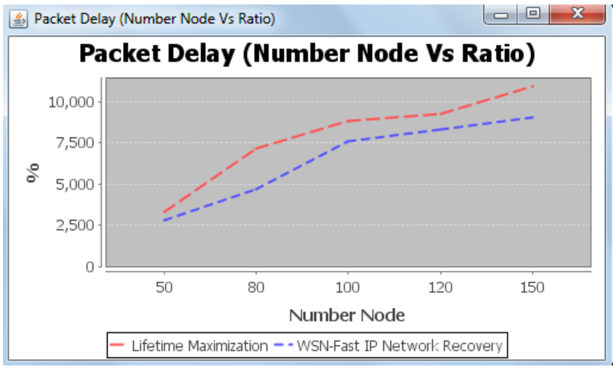
V. RESULT AND DISCUSSION

The following table shows the packet delay, success ratio and energy consumption when we are using WSN Fast IP network recovery and Lifetime Maximization algorithm.

Table 1: Packet Delay

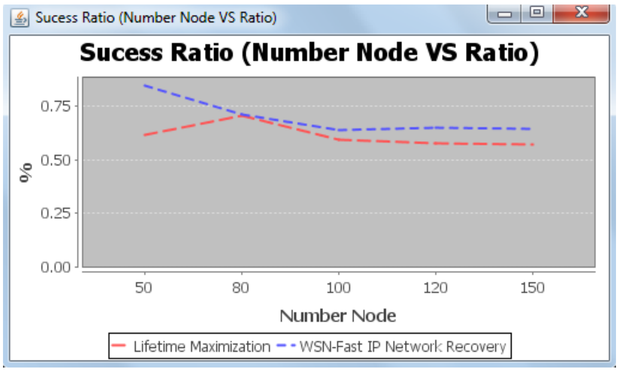
No of Nodes	WSN Fast IP Network Recovery	Life time maximization
50	2500	3000
80	4900	6500
100	7500	8200
120	8000	9000
150	8500	11000



In above graph shows packet delay ratio for WSN Fast IP network recovery and Lifetime maximization. WSN Fast IP network always gives less packet delay than Lifetime maximization. When number of nodes increase, packet delay also increases

Table 2: Success Ratio

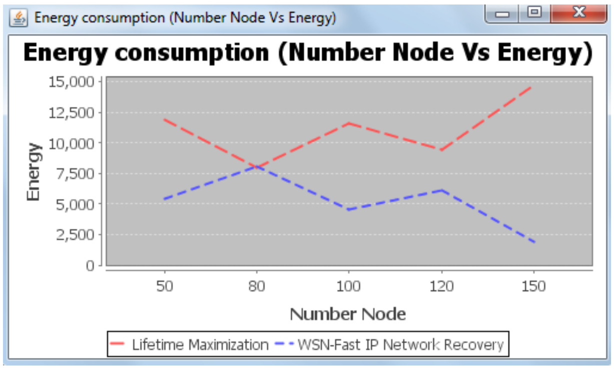
No of Nodes	WSN Fast IP Network Recovery	Life time maximization
50	0.95	0.60
80	0.70	0.69
100	0.65	0.60
120	0.67	0.64
150	0.67	0.63



In above graph shows success ratio for WSN Fast IP network recovery and Lifetime maximization. Success ratio for WSN Fast IP network is always better than Lifetime Maximization. For node 80, success ratio is nearly same for both WSN Fast IP network recovery and Lifetime maximization

Table 3: Energy Consumption

No of Nodes	WSN Fast IP Network Recovery	Life time maximization
50	5100	12300
80	7700	7700
100	4800	12200
120	6000	9800
150	2300	14900



In above graph shows energy consumption for WSN Fast IP network recovery and Lifetime maximization. Lifetime maximization has very high energy consumption as number of nodes increased. But in WSN Fast IP network recovery, energy consumption is decreasing as number of nodes increase.

ISSN: 2278 – 1323

VI. Conclusion

To achieve the fast recovery from failure network and also to maximize lifetime of wireless sensor network, we use the set of pre-deliberated routing paths conformation and non-ideal batteries. The main goal of this schema is to give the proper distribution of load after recovery of failed component. And achieve fast routing of data by using alternative routing paths which are pre-deliberated in configuration

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Acknowledgment

I am very grateful to Savitribai Phule Pune University and SKN Engineering College to allowing me all required facilities. Also I am very thankful to my project guide Prof. S.P. Pingat for their valuable guidance.

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ISSN: 2278 – 1323