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A DISTRIBUTED FAULT-TOLERANT TOPOLOGY

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Abstract: **The resulting topologies are tolerant to k - 1 node failures in the worst case. We prove the correctness of our approach by showing that topologies generated by DPV are guaranteed to satisfy k -vertex supernode connectivity. Our simulations show that the DPV algorithm achieves up to 4-fold reduction in total transmission power required in the network and 2-fold reduction in maximum transmission power required in a node compared to existing solutions.**

I INTRODUCTION

WSNs are typically composed of large number of tiny sensors that are capable of sensing, processing and transmitting data via wireless links.

This paper introduces a new algorithm called the Disjoint Path Vector (DPV) algorithm for constructing a fault tolerant topology to route data collected by sensor nodes to supernodes. In WSNs, guaranteeing k-connectivity of the communication graph is fundamental to obtain a certain degree of fault tolerance. The resulting topology is tolerant up to k-1 node failures in the worst case. We propose a distributed algorithm, namely t he DPV algorithm, for solving this problem in an efficient way in terms of total transmission power of the resulting topologies, maximum transmission power assigned to sensor nodes, and total number of control message transmissions.

Our simulation results show that our DPV algorithm achieves between 2. 5 fold a n d 4 fold reduction in total transmission power required in the network, depending on the packet loss rate, and a 2fold reduction in maximum transmission power required in a node compared to existing solutions. The power efficiency of our algorithm directly results from the novel appro ach that we apply while discovering t he disjoint paths. This approach involves in storing full path information instead of just next node information on the paths an d provides a large search scope for discovering the best paths throughout the network without the need of global network topology.

II PROPOSED SYSTEM

We propose a new algorithm, called Disjoint Path Vector(DPV) Algorithm, for fault-tolerant topology control in two-tiered heterogeneous WSNs consisting of resource-rich supernodes and simple sensor nodes with batteries of limited capacity. Our algorithm differs from DATC by the approach that we adopt for discovering vertex disjoint paths. In contrary to DATC, in our algorithm, a sensor node can discover paths including nodes outside of its reachable neighborhood. This is achieved by storing full path information from super nodes to sensor nodes in local information tables. In this way, the DPV algorithm has more chance to discover better k-disjoint paths than DATC. Another difference of our algorithm from DATC is that, we decrease the power level only after deciding the final topology. During path discovery in the DPV algorithm, nodes operate with maximum power, thus, increasing the likelihood of discovering more paths than DATC.

- **Advantages**: The DPV algorithm achieves up to 4-fold reduction in total transmission power required in the network and 2-fold reduction in maximum transmission power required in a node compared to existing solutions.

III NETWORK FORMATION

- In this Module, We consider a heterogeneous WSN consisting of M supernodes and N sensor nodes, with M << N. Sensor nodes are randomly deployed in the 2D plane. Supernodes are deployed at known locations manually. We are interested in sensor-sensor and sensor-supernode communications only. We do not model supernode-to-supernode communications because we assume that supernodes are not energy constrained and thus can directly communicate with a base station or can send data collected from sensors to other supernodes if necessary. Delivering a message originated at a sensor node to any of the supernodes is considered a successful delivery. In the initial network topology each sensor node has transmission range Rmax.

IV SYSTEM ANALYSIS

Proposed System

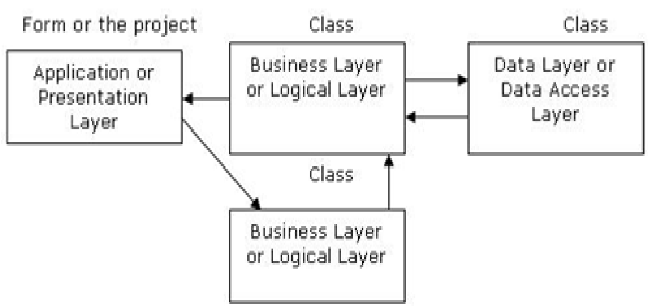
- We propose a new algorithm, called Disjoint Path Vector Algorithm, for fault-tolerant topology control in two-tiered heterogeneous WSNs consisting of resource-rich supernodes and simple sensor nodes with batteries of limited capacity.
- The DPV algorithm addresses the k -degree Anycast Topology Control problem where the main objective is to assign each sensor's transmission range such that each has at least k -vertex-disjoint paths to supernodes and the total power consumption is minimum.
- **Advantages**: The DPV algorithm achieves up to 4-fold reduction in total transmission power required in the network and 2-fold reduction in maximum transmission power required in a node compared to existing solutions.

Architecture Diagram:

Three Tier Architecture:

3-tier application is a program which is organized into three major disjunctive tiers on layers. Here we can see that how these layers increase the reusability of codes.

These layers are described below



- Application layer is the form where we design using the controls like textbox, labels, command buttons etc.
- Business layer is the class where we write the functions which get the data from the application layer and passes through the data access layer.
- Data layer is also the class which gets the data from the business layer and sends it to the database or gets the data from the database and sends it to the business layer.
- Property layer is the sub layer of the business layer in which we make the properties to sent or get the values from the application layer. These properties help to sustain the value in a object so that we can get these values till the object destroy.

Data flow from application layer to data layer

` Here we are passing the code of the student to the business layer and on the behalf of that getting the data from the database which is being displayed on the application layer.

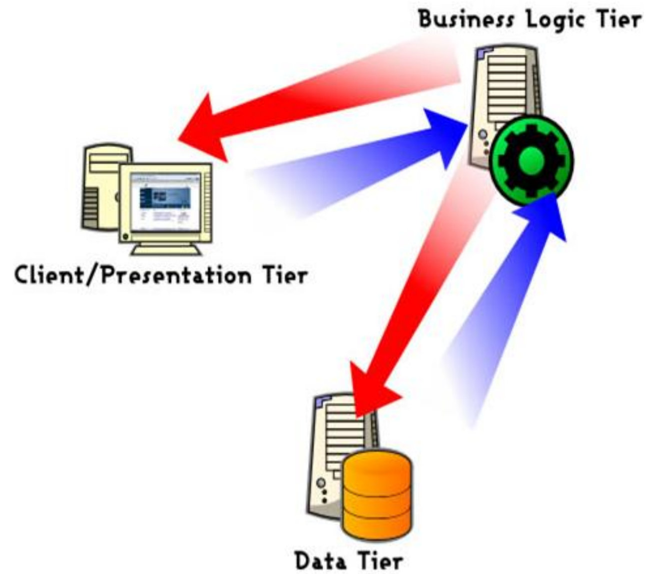


Figure 1 : Data Flow

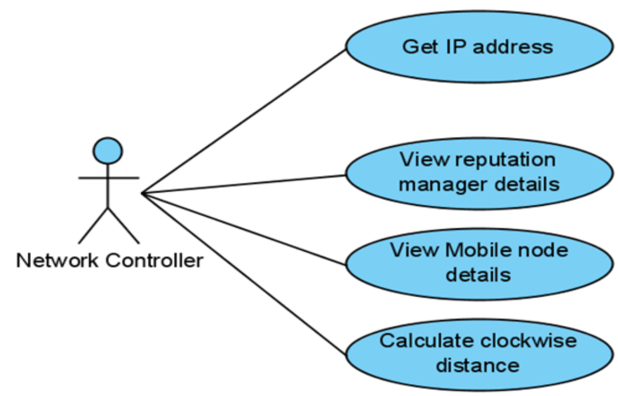


Figure 2: Use case diagram

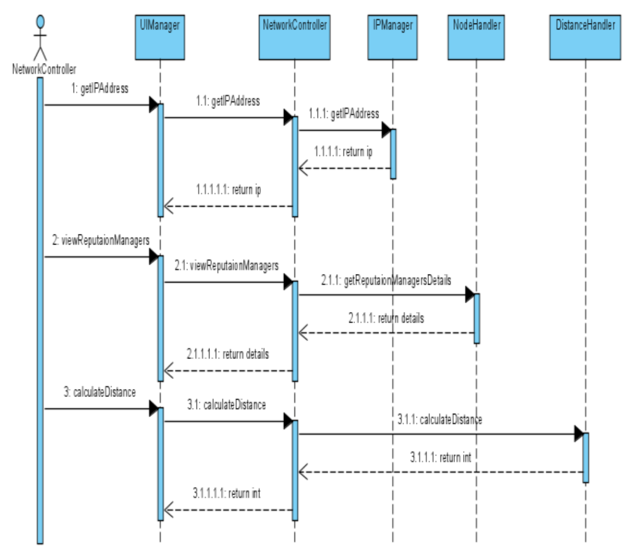
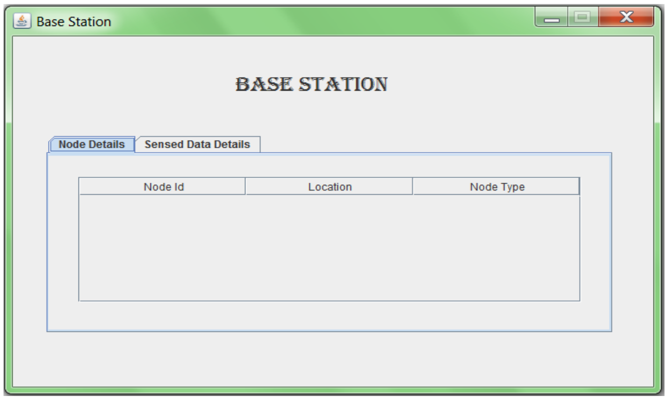
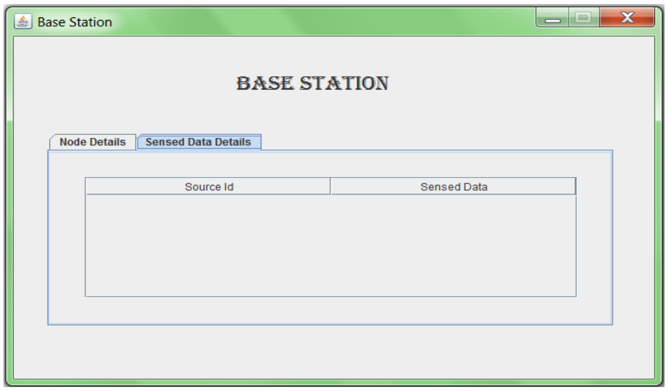


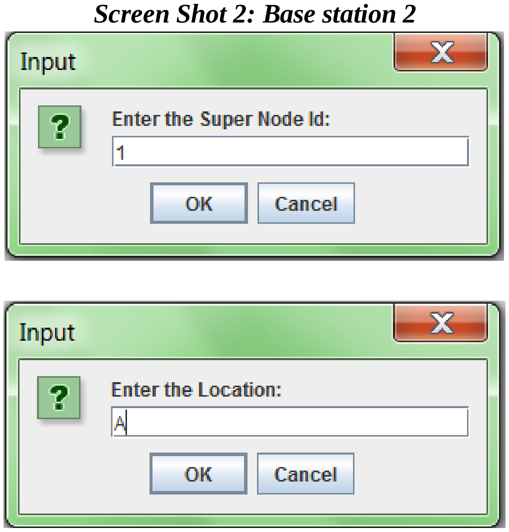
Figure 3: Sequence Diagram



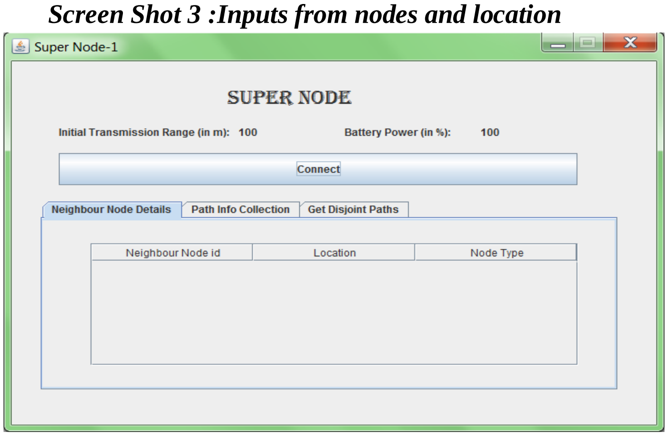
Screen Shot 1: Base station1



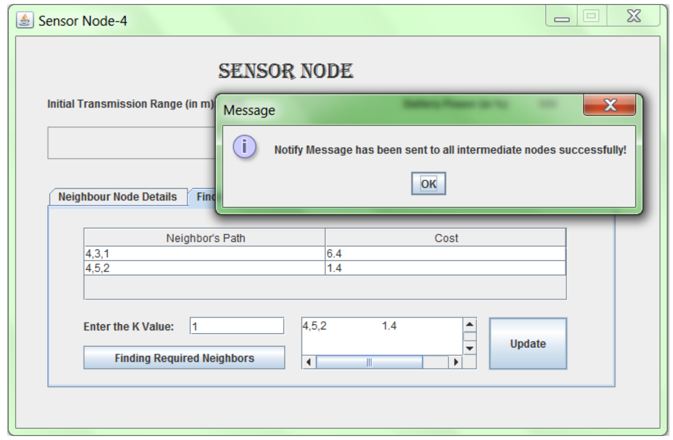
Screen Shot 2: Base station 2



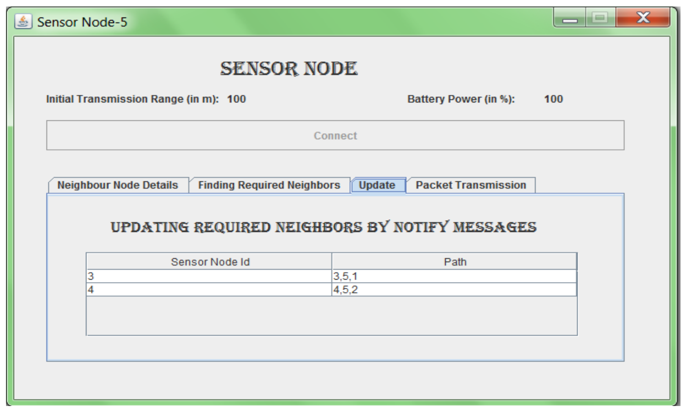
Screen Shot 3 :Inputs from nodes and location



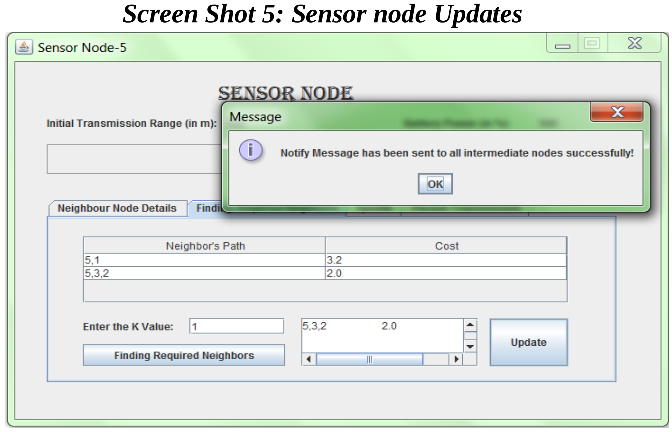
Screen Shot 4:Super node



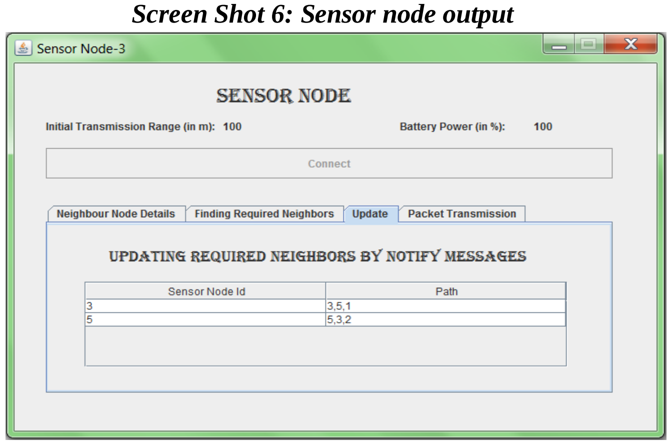
Screen Shot 4: Sensor node Working



Screen Shot 5: Sensor node Updates



Screen Shot 6: Sensor node output



Screen Shot 7: Sensor node notify message

Screen Shot 8: Sensor node operations

V CONCLUSION

In this paper we introduce a new distributed and fault-tolerant algorithm, called Disjoint Path Vector Algorithm (DPV), for constructing fault-tolerant topologies for heterogeneous wireless sensor networks consisting of supernodes and ordinary sensor nodes. Compared to an existing solution, the DATC algorithm, our DPV algorithm achieves a 4-fold reduction in total transmission power and a 2-fold reduction in maximum transmission power under t he assumption of no packet losses. When we consider the packet losses, 2.5-f old reduction in total power consumption can be achieved for a packet loss rate of 0.1. In addition, DPV achieves these results by requiring fewer message transmissions and receptions than DATC. The most important contribution of this study is to generate topologies that have total transmission powers close to GATC, which is a centralized algorithm. As mentioned before, GATC requires global network information and hence, it is less practical for large-scale networks. The solution that we propose is, however, distributed and localized, thus is scalable to large networks and therefore suitable for use in real applications.

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