A REVIEW PAPER ON OPPORTUNISTIC ROUTING IN WIRELESS SENSOR NETWORK

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Abstract: The wireless sensor network is the self configuring type of network which can be used to sense environmental conditions like temperature, pressure etc. The main issue in wireless sensor network is the battery consumption as it is very difficult to recharge or replace battery of sensor nodes. To increase lifetime of the sensor networks technique of clustering will be applied in which static and dynamic clustering techniques will be applied. In the previous technique, opportunistic based routing is proposed for data routing in wireless sensor networks, in which the source node store the data on the intermediate node which will move near to the base station and deliver data to the base station. The data which is stored on the intermediate node also given the priority and data which has higher priority is delivered first to base station. In this paper, we discuss some research challenges in an opportunistic based routing.

IndexTerms **– Opportunistic Network, Sensor Nodes, Wireless Sensor Networks, Routing.**

I. INTRODUCTION

Opportunistic network have materialize as an evolution of the MANETs (Mobile ad Hoc Networks). It can also used to sense environmental conditions like temperature, pressure etc. For example, in environment where there is not a foundational infrastructure wit typical application including wildlife tracking, search and rescue, underwater sensor network and military environment. In Opportunistic network communication possible even if no connecting route exists between nodes. Routers are built energetic i.e. communication path not pre-decided. In Opportunistic routing for the next hop, a node would be Opportunist can choose only if it would bring the message closer to final destination.

1.1 An Overview of Opportunistic Routing.

A. **How Opportunistic Routing Work**: - In Opportunistic Routing we use so many nodes. Each node receiving a message exploits LOCAL knowledge to decide which is the best next hop, among its current neighbors, for the message to reach the eventual packet destination. When no forwarding opportunity exists the node save the message and waits for future contact opportunities with other devices to forward the information. {e.g. :- Delay-Tolerant}

B. **When node become sick**: - In Opportunistic networking we have several routing and forwarding techniques. Like one is very interesting and reliable technique is epidemic routing. In this message spread in the network similar to disease or viruses by means of contract between node. A node is contaminated by a message when it either generates a message. The another possibility is when the message receives from another node for forwarding. In this case the infected node stores the message in a local buffer. A node is vulnerable to infection when it has not yet received the message.

C. **Architecture**: - The[8] intermediate node implement the store-carry-forward message switching mechanism by overlaying a new protocol layer, called the bundle layer, on top of variegated region-specific lower layer as shown in figure1. In an Opportunistic network, each node is an entity with a bundle layer which can act as a gateway. A gateway can forward bundles between two or more regions and may optionally be a host, so it must have persistent storage and support custody transfer.

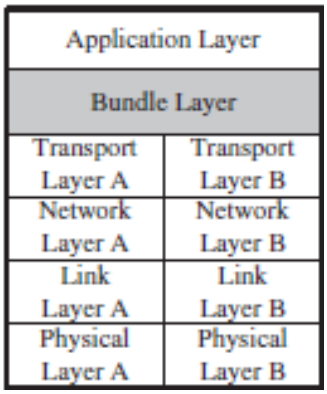

Fig.1. The protocol stack

II. CLASSIFICATION OF ROUTING PROTOCOLS

A. **Routing in WSN: -** WSNs are planned for monitoring an environment. The main aim of a wireless sensor node is to collect data from a certain domain, process them and forward it to the sink, where the application lies. However, by guaranteeing the direct communication between a sensor and the sink may drain the nodes' power very speedily, because of higher energy requirement in transferring messages. Therefore, it is sometimes required that the nodes are collaborated to ensure communication of distant nodes with the sink. In this way, messages are propagated through intermediate nodes

by establishing a route to the sink. Routing protocols for WSN are in charge of discovering and maintaining the routes in the network [1].

B. **Routing in Opportunistic Network: -** Opportunistic routing has recently attracted much attention as it is considered a promising direction for humanizing the performance of wireless ad hoc and sensor networks. With opportunistic routing, intermediate nodes work together on packet forwarding in a contained and consistent manner. Opportunistic routing greatly increases transmission reliability and network throughput by taking advantage of the broadcast nature of the wireless medium. [2]

In this review paper routing in opportunistic network can be explain. There are six routing protocol review in this paper that is:

- Epidemic routing protocol
- Spray and wait protocol
- ProPHET
- HiBop
- HBPR
- KNNR

III. Classification of Opportunistic Routing Protocols

A. Epidemic routing protocol : - Epidemic routing protocol [3] is the basic routing protocol which employs the technique of flooding for delivering the messages. Whenever a node encounters another node, it transfers all the messages which the other node doesn't possess. Though this strategy ensures high delivery ratio, the network contains several copies of one message at a particular time. That's why bandwidth and buffer requirement for efficient implementation of Epidemic protocol are high.

B. Spray and Wait protocol :- One of the main limitations of Epidemic routing protocol is that it generates redundant message copies. Spray and Wait protocol [4] limits the copies of a message currently present in the network thus controlling the network congestion. This protocol works in two phases: Spray phase and Wait phase. In Spray phase, source node creates the message and then transmits it over to *L* distinct nodes. If none of these relay node is the destination node, then the protocol enters in the Wait phase where all the relayed messages wait for the direct transmission. One of the main advantage apart from controlling congestion is its high scalability i.e. change in network size doesn't affect the efficiency of Spray and Wait protocol.

C. ProPHET :- ProPHET [5] assumes that in real world, nodes do not move randomly but follow a certain conventional pattern. It uses probabilistic metric called delivery predictability, P(a,b) ϵ[0,1], which is maintained by each node *'a'* for every known destination *'b'*. It is the measure of possibility of message delivery from source to destination node. Delivery predictability is calculated considering the frequency of encounters, aging and transitivity. Nodes having high encounter frequency have higher delivery predictability. If a node does not get in contact for a long time then aging factor is taken into account and delivery predictability value is decreased. To forward the message, when two nodes encounter each other they swap their delivery predictability values and node forwards the message only if the value of delivery predictability with respect to the destination is higher for the other node i.e. the other node has greater possibility to deliver the message to the destination.

D. History based Routing Protocol (HiBOp):- This [6] is a context based routing protocol which makes use of the context information stored by the node to find the path which is best suitable for successful delivery of message in minimum time. Context can be thought of as information about the environment that the node is currently located in. HiBOp defines two tables: Identity Table and History Table. Using the information stored in these tables, HiBOp protocol determines how similar the context information stored by the neighbour node is with the Identity table of destination. If it is highly similar then message is forwarded to that node. HiBOp significantly reduces resource consumption and message loss rate but consumes a lot of memory by storing the tables.

E. History Based Prediction for Routing (HBPR):- This [7] is another context based routing algorithm. To predict next position of the node it uses earlier period movement record of the node. This information can be used to predict the geographical location of the node and the neighbours which can be used to find out the proximity of a node to the destination. Using the context information stored in tables, HBPR protocol calculates a parameter called Utility Metric [7]. The Utility Metric is a significance of three parameters i.e. Node's movement stability, prediction of direction of movement using Markov Predictor [7] and the perpendicular distance of the neighbouring nodes from the line of sight of source and destination. Along with the calculation of Utility Metric, a doorstep is fixed. The message copy is given to the node if it has the Utility Metric value more than the doorstep.

F. Nearest Neighbour Classification based Routing Protocol (KNNR):- This[8] for OppNets has been proposed. Due to volatile nature of nodes, it becomes important to keep integrating the node's past behavior in decision making connecting to new nodes or instances. The planned protocol consists of two phases: training and application. In training phase dataset is created by recording different network parameters namely buffer space available, Time Out Ratio, hop count, neighbour node distance from destination, speed of neighbours, communication probability. After building the dataset the protocol enters in the application phase where decision regarding message transfer to the neighbour node is made based on the class it belongs. Through simulations, it is observed that the KNNR protocol is better in terms of message delivery probability, average latency, average hop count and overhead ratio when compared with Epidemic, ProPHET and HBPR protocols due to restriction imposed on the succeeding hop selection process by this protocol.

IV. Conclusion And Future Work

To increase lifetime of the sensor networks technique of clustering will be applied in which static and dynamic clustering techniques will be applied. In the previous technique, opportunistic based routing is proposed for data routing in wireless sensor networks, in which the source node store the data on the intermediate node which will move near to the base station and deliver data to the base station. The data which is stored on the intermediate node also given the priority and data which has higher priority is delivered first to base station. In this paper various opportunistic routing techniques have been discussed. KNNR protocol is better in terms of message delivery probability, average latency, average hop count and overhead ratio when compared with Epidemic, ProPHET and HBPR protocols due to restriction imposed on the succeeding hop selection process by this protocol. Further, opportunistic routing can be improved by synchronizing the clocks of sensor nodes to increase network stability.

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