A Survey: Sensor Node Loalization in Underwater Sensor Network Using Vector Based Forwarding

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Abstract— Underwater sensor networks (UWSN) resemble terrestrial sensor networks in many aspects. However, the high propagation delay and limited bandwidth make terrestrial sensor network's protocols unsuitable for UWSN. Underwater sensor nodes are powered by batteries which are even difficult to recharge. So, energy efficiency is major concern for underwater routing. In this paper, based on VBF, we provide a new routing protocol, efficient VBF. In this paper we discuss the some fundamental about underwater sensor network, issue relating to routing, related work, our proposed protocol and result analysis and conclusion.

Key words: Acoustic sensor network, vector, depth, routing

I. INTRODUCTION

Earth is largely covered by water. This is largely unexplored area and recently humans are showing interest towards exploring it Underwater Acoustic Sensor Networks (UW-ASN) consist of a variable number of sensors that are deployed to perform the monitoring tasks over a given area. Many disasters that took place in recent past made humans to greatly monitor the oceanic environments for scientific, environmental, military needs etc., in order to perform these monitoring task industries are showing interest towards deploying sensor nodes under water[1].

TWSNs operate in an environment dominated by RF communication. Yet, RF communication is not an optimal communication channel for underwater applications because of the extremely limited RF wave's propagation underwater. Conductive sea water only at extra low frequencies (30 ¡ 300 Hz), which require large antennae and high transmission power. Thus, links in underwater networks are based on acoustic wireless communications acoustic communications are the typical [2].

A. Problem with Routing In Underwater Sensor Network:

There are many problem with routing in underwater sensor network [3]. Those problems are:

1) Harsh Deployment Environment Is The Major Challenging Factor Which Comes Under Routing Protocol For Underwater Sensor Network.

2) Bandwidth Capacity Is Low Because Routing Protocol For Underwater Sensor Network Comes From High Bit Error Rates.

3) Another Problem Related To Low Energy Problem.

4) To Provide Energy For Under Water Sensors Battery Energy Is Require.

5) Radio Single Are Not Efficient Compare To Routing Protocol For Underwater Sensor Network. Because It Provides High Propagation Delays.

6) High Propagation Delays Are The Major Factor Of Routing Protocol For Underwater Sensor Network.

II. RELATED WORK

There are many routing protocol in underwater sensor network.

There are four family of routing protocol in underwater sensor network [4]. Those are:

- Flooding based routing family
- Multipath based routing family
- Cluster based routing family
- Miscellaneous based routing family

In Flooding based routing protocol, the source node broadcast the packet to all other node within its range. So, due to broadcasting, duplicate packet will transmitted and high energy consumption will result.

In multipath based routing protocol, more than one path from source node to destination node are established. So, packet delivery ratio can improve to transmit the multiple path simultaneously.

In cluster based routing protocol, the sensor nodes are grouped together into clusters. In this type of approach, the sensor nodes are divided into two types: cluster-head nodes and cluster member nodes. The cluster-head is a node which is responsible for the collection of the data packets from its cluster members. The cluster member nodes sense the data and transmit the data packets to their corresponding cluster heads.

In Miscellaneous based protocols includes Adaptive, ICRP, phero-trail etc.

The Vector Based Routing protocol is based on flooding based protocol. In VBF does not require full dimension of location information of sensor nodes. In VBF depth will obtained by the depth sensor which are attach to the ordinary sensor nodes. The key idea of VBF is when a node receive the packet, it forward the packet when its depth is smaller than embedded in the packet. Otherwise it drop the packet [5].

The protocol operation can be summarized as follows. Upon the reception of a packet, a node verifies itself as a qualified forwarder based on the depth difference with the sender of the packet. If a node is a qualified forwarder the node computes the holding time and inserts the packet into priority queue Q1, otherwise the packet is dropped. In case the node is a qualified forwarder, the packet is transmitted upon the expiry of the holding time and the information about the transmitted packet is recorded in packet history buffer Q2. In order to suppress the transmission of the duplicate packets, a node always checks packet history buffer Q2 before transmitting a packet. Due to the flooding based approach, VBF will generate the duplicate packet, therefore based on the VBF we proposed new protocol, efficient VBF.

III. EFFICIENT VBF PROTOCOL

Underwater acoustic sensor network structure is shown in the figure 1.There are two kind of nodes, ordinary sensor nodes and sink node. Sink nodes are deployed on water surface which have two communication module, acoustic communication module and RF communication module. The ordinary sensor node are in water which have only one communication module, acoustic communication module. They collect the data and pass to its neighbor nodes. They collect the data and pass to its neighbor too.

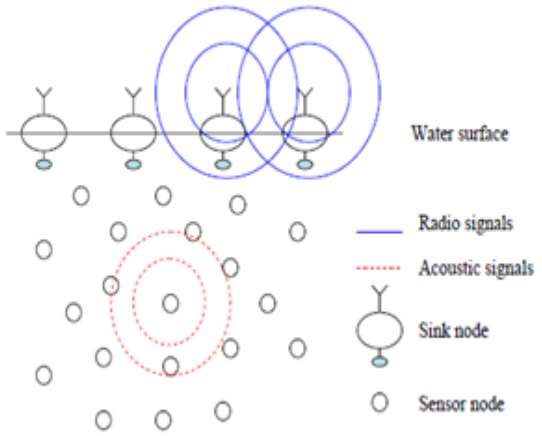

Fig. 1: Structure of VBF

A. *Packet Transmission Process In Efficient VBF:*

There are several steps of transmission process in efficient VBF

Step 1: Source node broadcast the request packet with its vector and waits the T amount of time. T depends on propagation delay and sensing range.

Show in figure 2, the source node S broadcast the request packet with its depth within its range. Node n1, n2, and n3 receive the packet. Here node n3 is below the source node so it's simply drop the packet.

Step 2: Node n1 and n2 check the two conditions, d1>ds or d1<ds. Same way d2>ds or d2<ds. If d1>ds and d2>ds then simply discard the packet. Otherwise n1 and n2 send the reply packet to the source node with its depth and node ID.

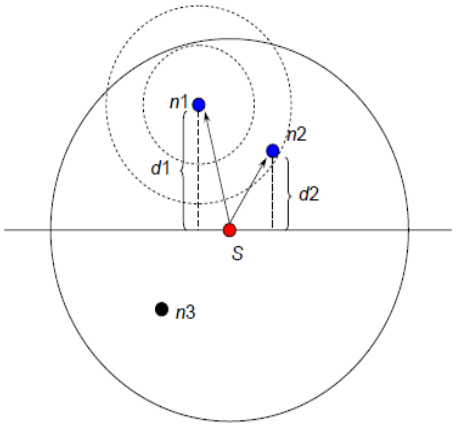

Fig. 2: example of transmission process

Step 3: Source node stores the reply packet in the buffer.

Step 4: After T amount of time the source node check the buffer and find the minimum depth node. Here n1 has minimum depth.

Step 5: Source node directly sends the packet to node n1.

IV. SIMULATION SETTING

In this paper simulation are performed using NS2 with aqua-sim. From energy consumption and delivery ratio to analyze the efficient in underwater sensor network. Packet ratio means ratio of number of packet received by receiver and number of packet generated by sender. Energy consumption is total energy consumption by entire process. In our simulation each node has a same communication range 120m. All ordinary node are follow a random mobility pattern but depth is fixed.

A. *Result Analysis:*

The result analysis of efficient VBF is below.

In fig 3 show the energy consumption of both protocol. We have taken the 20, 40, 80, 60 and 100 numbers of nodes. When number of node increase, the energy consumption will increase because the more number of packets will take the participate into forwarding the packet. In above graph we have seen that our proposed protocol is energy efficient than existing Vector Based Routing protocol.

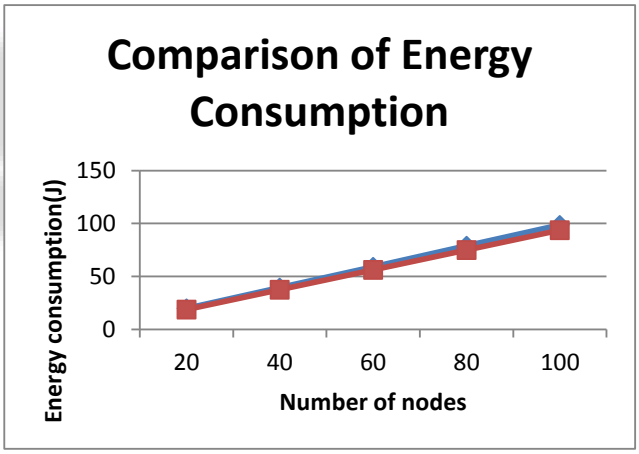

Fig. 3: Comparison of Energy consumption

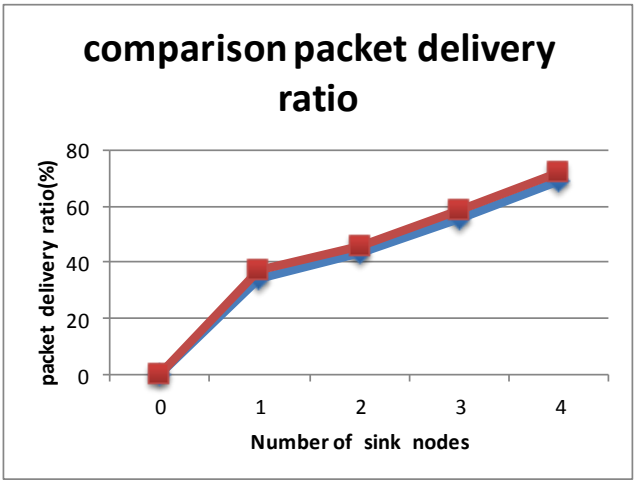

Fig. 4: Comparison of packet delivery ratio

In fig 4 show the packet delivery ratio of both protocol. We have taken the 0, 1, 2, 3 and 4 numbers of sink nodes. When number of sink node increase, the packet delivery ratio will increase because the more number of packets will receive by the sink node. In above graph we have seen that our proposed protocol has higher packet delivery ratio than existing Vector Based Routing protocol.

V. CONCLUSIONS

In this paper, we present the efficient VBF protocol. It only need the vector information of the nodes. Simulation result show that, it improves the much of distance based and energy efficiency.

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