GEDAR Based Routing For Underwater Sensor Networks

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***Abstract*—Underwater wireless sensor networks (UWSNs) have been showed as a promising technology to observe and explore the oceans in lieu of conventional undersea wire line instruments. Nevertheless, the data gathering of UWSNs is still Severely limited because of the acoustic channel communication characteristics. One way to develop the data gathering in UWSNs is through the design of routing protocols considering the unique characteristics of the underwater acoustic communication and the extremely dynamic network topology. In this project, we propose the GEDAR routing protocol for UWSNs. GEDAR is an any cast, geographic and opportunistic routing protocol that routes data packets from sensor nodes to multiple sonobuoys at the sea's surface. When the node is in a message void region, GEDAR switches to the improvement mode procedure which is based on topology control through the depth adjustment of the void nodes, instead of the traditional approaches using control messages to discover and maintain routing paths along void regions. Simulation results show that GEDAR significantly improves the network performance when compared with the baseline solutions, even in hard and difficult mobile scenarios of very sparse and very dense networks and for high network traffic loads.**

***KEYWORDS*-Geographic routing, local minimum problem, topology control, underwater sensor networks**

I. INTRODUCTION

Ocean represent more than 2/3 of the Earth's surface. These environments are extremely important for human life because their roles on the primary global production, carbon dioxide (CO_2) absorption and Earth's climate regulation, for instance. In this context, underwater wireless sensor networks (UWSNs) have gained the attention of the scientific and industrial communities due their potential to monitor and explore aquatic environments. UWSNs have a wide range of possible applications such as to monitoring of marine life, pollutant content, geological processes on the ocean floor, oilfields, climate, and tsunamis and seaquakes; to collect oceanographic data, ocean and offshore sampling, navigation assistance, and mine recognition, in addition to being utilized for tactic surveillance applications.

ROLE OF UNDERWATER SENSOR NETWORK

Underwater sensor network able to perform operations in wide range of applications that application are perform different in underwater sensor network some applications likes mine reconnaissance, distributed tactical surveillance, seismic monitoring, ocean sampling networks, equipment monitoring, environmental monitoring, assisted Navigation, Disaster prevention and undersea explorations these all are the advantages of the underwater sensor networks. Since no system is perfect, therefore, even with all the above mentioned advantages of the system, a few disadvantages still exit like costly devices, more power requirement, Intermitted memory, Spatial correlation.

Different routing protocol perform different role in the underwater sensor network. All routing perform each and specific task into underwater sensor network which responsible for networking problems issue that is why this is the latest way of research. Routing term derived from "route" that means a path a way that perform different terms in underwater sensor network problem related issue. The best part is today many routing protocol are present in the underwater wireless sensor network. Some different attributes comes underwater wireless sensor network like likes high bit error rates, limited band-width, 3D deployment and high propagation delay.

II. EXISTING TECHNIQUES

Depth-based routing (DBR) routing protocol is the first underwater sensor network routing protocol that uses node depth information to route data packets.

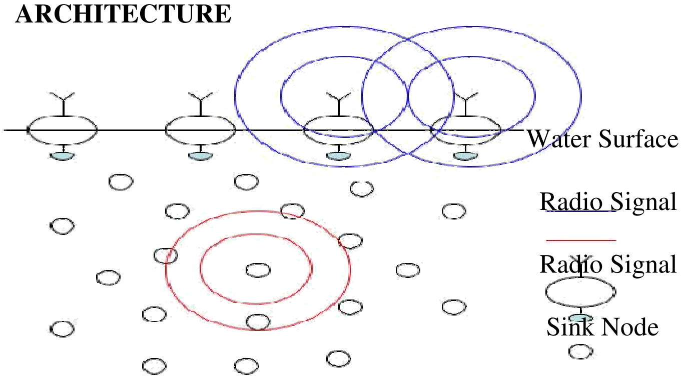
The basic idea of DBR is to forward data packets greedily towards the water surface. Thus, packets can reach multiple data sinks deployed at the water surface. During the forwarding, the current sender broadcasts the packet. After receiving it, if the receiver is closer to the water surface, it becomes qualified as a candidate to forward the packet. Otherwise, it will discard the packet. Each qualified candidate will forward the packet in a prioritized manner if its distance to the current forwarder is at least d_{th} and it has not previously sent this packet previously. Node priority is given by means of the holding time. The farther the candidate node is on the current forwarder, the lower is its holding time. After the holding time, the packet is broadcast if the node has not received the same data from a neighbor This can be expensivein terms of energy since the high energy cost of underwater acoustic communication and the impairments of the acoustic channel.

III. PROPOSED TECNIQUES

GEDAR is an any cast, geographic and opportunistic protocol that tries to deliver a packet from a source node to some sonobuoys. During the course, GEDAR uses the greedy forwarding strategy to advance the packet, at each hop, towards the surface sonobuoys.

A recovery mode procedure based on the depth adjustment of the void node is used to route data packet when it get stuck at a void node. The proposed routing protocol employs the greedy for-warding strategy by means of the position information of the current forwarder node, its neighbors, and the known sonobuoys, to determine the qualified neighbors to continue forwarding the packet towards some sonobuoys.

UNDERWATER SENSOR NETWORK ARCHITECTURE



Despite greedy forwarding strategy being a well known and used next-hop forwarder selection strategy, GEDAR considers the any cast nature of underwater routing when multiple surface sonobuoys are used as sink nodes.

IV. IMPLIMENTATION

Underwater wireless sensor network SEA (Sensor Equipped Aquatic) swarm architecture. In this architecture, we have a large number of mobile underwater sensor nodes at the ocean bottom and sonobuoys, also named sinks nodes, at the ocean surface. They move as a group with the water current. Each node is equipped with various sensor devices and with a low bandwidth acoustic modem which is used to periodically report the sensed data to the destinations (sonobuoys). Underwater sensor nodes can adjust its depth by means of inflatable buoys or winch based apparatus.

In a buoyancy-based depth adjustment system, a buoy can be inflated by a pump, bladders or other device to change the buoyancy of the float relative to the water. This system does not use propulsion mechanisms, reducing the energy cost to the depth adjustment.

DESIGIN OF GEDAR

In order to avoid long sizes of beacon messages, a sensor node includes only the position information of the sonobuoys it has not disseminated in the predecessor round. Whenever a node receives a new beacon message, if it has come from a sonobuoy, the node updates the corresponding entry in the known sonobuoy set $S_i(t)$. Otherwise, it updates its known sonobuoys S_i set in the corresponding entries if the information location contained in the beacon message is more recent than the location information in its set S_i. For each updated entry, the node changes the appropriate flag to zero, indicating that this information was not propagated to its neighbors. Thus, in the next beacon message, only the entries in $S_i(t)$ in which the Λ is equal to zero are embedded . We add random jitters between 0 and 1 during the broadcast of beacon messages, to minimize the chance of both collisions and synchronization. Moreover, after a node broadcasts a beacon, it sets up a new timeout for the next beaconing.

NEIGHBORS CANDIDATE SET SELECTION

A sensor node has a packet to send, it should determine which neighbors are qualified to be the next-hop forwarder. GEDAR uses the greedy forwarding strategy to determine the set of neighbors able to continue the forwarding towards respective sonobuoys. The basic idea of the greedy forwarding strategy is, in each hop, to advance the packet towards some surface sonobuoy. The neighbor candidate set is determined as follows. Let n_i be a node that has a packet to deliver, let its set of neighbors be $N_i(t)$ and the set of known sonobuoys $S_i(t)$ at time t. We use the packet advancement metric to determine the neighbors able to forward the packet towards some destination. The packet advancement is defined as the distance between the source node S and the destination node.

NEXT-HOP FORWARDER SET SELECTION

GEDAR uses opportunistic routing to deal with underwater acoustic channel characteristics. In traditional multi hop routing paradigm, only one neighbor is selected to act as a next-hop forwarder. If the link to this neighbor is not performing well, a packet may be lost even though other neighbor may have overheard it. In opportunistic routing, taking advantage of the shared transmission medium, each packet is broadcast to a forwarding set composed of several neighbors. The packet will be retransmitted only if none of the neighbors in the set receive it. Opportunistic routing (OR) has advantages and disadvantages that impact on the network performance. However, as the neighboring nodes should wait for the time needed to the packet reaches the furthest node in the forwarding set, OR leads to a high end-to-end latency. For each transmission, a next-hop forwarder set F is determined. The next-hop forwarder set is composed of the most suitable nodes from the next-hop candidate set C_i so that all selected nodes must hear the transmission of each other aiming to avoid the hidden terminal problem. The problem of finding a subset of nodes, in which each one can hear the transmission of all nodes, is a variant of the maximum clique problem, that is computationally hard.

RECOVERY MODE

We advocate that depth-adjustment based topology control for void node recovery is more effective in terms of data delivery and energy consumption than message-based void node recovery procedures in UWSNs given the harsh environment and the expensive energy consumption of data communication. In the recovery mode procedure, the void node changes its status, stops the beaconing, sends a void node announcement message to announce its void node condition to the neighborhood, and schedules the procedure to calculate its new depth. When a neighbor node receives a void node announcement message, it removes the sender from its neighbor table and, from the updated neighbor table, determines whether it is a void node or not. If the receiver node will be not a void node, it replies the received message with a void node announcement reply message.

V. CONCLUSION

The GEDAR routing protocol to improve the data routing in underwater sensor networks. GEDAR is a simple and scalable geographic routing protocol that uses the position information of the nodes and takes advantage of the broadcast communication medium to greedily and opportunistically forward data packets towards the sea surface sonobuoys. Furthermore, GEDAR provides a novel depth adjustment based topology control mechanism used to move void nodes to new depths to overcome the communication void regions. Our simulation results showed that geographic routing protocols based on the position location of the nodes are more efficient than pressure routing protocols. Moreover, opportunistic routing proved crucial for the performance of the network besides the number of transmissions required to deliver the packet. The use of node depth adjustment to cope with communication void regions improved significantly the network performance. GEDAR efficiently reduces the percentage of nodes in communication void regions to 58% for medium density scenarios as compared with GUF and reduces these nodes to approximately 44% as compared with GOR. Consequently, GEDAR improves the network Performance when compared with existing underwater routing protocols for different scenarios of network density and traffic load.

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