ANALYSIS FOR CONTROLLING TRAFFIC OVERHEAD IN UWASN FOR STATIC AND MOVING NODES

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ABSTRACT

The oceans remain the minimum investigated limits on this planet and numerous maritime and oceans applications appear to be generally moderate in abusing the cutting edge information correspondence advances. The common and man-made disasters that have occurred in the course of the most recent couple of years have created huge enthusiasm for checking maritime conditions for scientific, environmental, commercial, safety, homeland security and military needs. The shipbuilding and seaward designing businesses are progressively keen on advances like sensor networks as a financially suitable option to at present. It is also utilized in seismic monitoring, structural health monitoring, installation and mooring. Underwater sensor networks (UWSNs) are the empowering innovation for extensive variety of applications like observing the solid impacts and effect of atmosphere, nutrient production, oil recovery and transportation. [1][2]

This paper presents a survey of the routing protocols for UWSN Communication. The unique characteristics of underwater acoustic communication like low bandwidth and high propagation delays forced to find the efficient and reliable communication protocol over multiple hops which can be either static or mobile[3][4].

In the UWSN communication reducing traffic overhead is another issue. While maintaining the route discovery, it identifies route failure which can generate a lot of traffic overhead. The proposed protocol tries to minimize this route traffic by detecting failure in a more intelligent way. This paper analyse the traffic overhead in UWSN scenario using the protocols LOARP and MLOARP which are proposed and found for a considerable group of nodes. The algorithm performs the high PDR when using the MLOARP then LOARP.

Keywords: Underwater Communication, Traffic Overhead, Ad-Hoc Networks, Multipath Routing Protocols, PSO.

INTRODUCTION

Ocean bottom sensor nodes are esteemed to empower applications for oceanographic information gathering, contamination checking, seaward investigation and strategic surveillance applications. Numerous Unmanned or Autonomous Underwater Vehicles (UUVs, AUVs), outfitted with underwater sensors, will likewise discover application in investigation of natural undersea resources and gathering of scientific data in collaborative monitoring missions. To make these applications reasonable, there is a need to empower underwater communications among underwater gadgets. Underwater sensor nodes and vehicles must have self-setup capacities, i.e., they should have the capacity to organize their activity by exchanging configuration, location and movement information, and to transfer checked information to an inland station. Wireless Underwater Acoustic Networking is the empowering innovation for these applications.

Underwater Acoustic Sensor Networks (UW-ASN) comprise of a variable number of sensors and vehicles that are conveyed to perform shared observing assignments over a given territory. To accomplish this goal, sensors and vehicles self-sort out in an autonomous network which can adjust to the qualities of the ocean environment.

Acoustic communications are typical physical layer innovation in underwater networks. Actually, radio waves propagate at long distances through conductive ocean water only at extra low frequencies (30-300 Hz), which require huge antennae and high transmission control. Optical waves do not suffer from such high attenuation but are affected by scattering. Accordingly, interfaces in underwater networks depend on acoustic wireless communications [1]. Underwater acoustic communication connections can be grouped by their range as long, medium, short, and very short links.

An underwater sensor network poses unique characteristics in networking as compared with the terrestrial networks. This section highlights the emerging research issues and challenges imposed by the underwater sensor network. There are various research issues with respect to the physical layer, data link layer, network layer, transport layer and application layer.

The function of network layer is to find path from source to the destination taking into account many characteristics of the channel such as long propagation delay, energy of the nodes. Routing protocols for ad hoc wireless sensor networks and sensor networks are discussed in [4] [5]. Because of the quite different nature of underwater environment there are several difficulties that need to be addressed for existing underwater networks.

Existing routing protocols are divided into three categories: proactive, reactive and geographical routing. The two main reasons for avoiding proactive protocols in sensor networks in underwater sensor networks are memory and energy [6] [7]. Reactive protocols are unsuitable for underwater networks because of high latency, asymmetrical links and topology. Geographical Routing Protocols work on localization information [8]. The source node selects its next hop based on position of its neighbors and the destination.

The open research issues at the network layer are as follows [10]

- Algorithms and protocols for routing layer need to be redeveloped to provide strict or loose latency bounds for time critical applications, to detect and deal with disconnections caused by failures, unforeseen mobility of nodes or battery depletion.

- There is a need to develop mechanisms to handle loss of connectivity without provoking immediate retransmissions for delay tolerant applications.
- Algorithms must be robust as the quality of link is highly unpredictable.
- Accurate modeling is needed for good understanding of dynamics in data transmission.
- Simulation models and apparatus need to be evolved.
- To react to reliable variation in usage of energy efficiency Local route optimization algorithms are needed

Systems are expected to incorporate AUVs in underwater networks and to empower communication among sensors and AUVs. Specifically, all the data accessible to sophisticated AUVs (trajectory, localization) could be misused to limit the signaling required for reconfigurations.[11][12]

If there is an occurrence of geographical routing protocols, it is important to devise proficient underwater positioning systems.

Real difficulties in the design of routing protocol in underwater acoustic networks are:

- The accessible data transfer capacity is restricted.
- High Traffic overhead.
- Battery control is restricted and can't be revived.
- The underwater channel is weakened on account of multi -path and fading.
- High bit blunder rates and temporary losses of connectivity.

TRAFFIC OVERHEAD

The overhead in wireless sensor network depends upon different network protocols like multi-path based routing, negotiation based routing, query based routing, quality of service based routing etc. Be that as it may, these strategies just give the solid ways yet don't give the methods to decreasing traffic overhead for bundle information exchange. To conquer the traffic overhead another system was proposed called information part method [3][4]. This procedure split the information bundle and sends them using redundant paths. However it reduces the traffic but does not ensure the reliable multi-paths to transmit the split packets into the networks. Now the problem is energy efficient multi-path routing protocol [3][8] ensure only the reliable multiple paths and data splitting technique proposed in [4] reduces the traffic overhead.

First one needs a higher method for reducing traffic and second one requires a better approach for reliable multi-paths. Therefore each of technique requires the alternative to ensure both reliability and reduced traffic overhead.

In wireless sensor network, reliability and traffic overhead remains a critical issue. To enhance the reliability we should, transmit the information in numerous ways from source node to sink node. Source node is a node which gathers information through its sensing gadgets discovers neighbor nodes and sends message to them; all intermediate nodes, which hand-off the information through multi- hop communication, have indistinguishable setup from the source nodes. Sink node is an exceptional, single node serving as the target, the message receiver.

On the off chance that researcher transmit similar information in various ways, the system wind up over stacked. So it is important to utilize splitting strategy in multipath routing protocol. Again in the event that researcher transmit the information in those paths which can't reach to the goal effectively then it is important to retransmit the information using swarm optimization technique to control traffic overhead.

LOARP

A Low overhead ad-hoc routing protocol (LOARP) for underwater networks is proposed. The protocol diminishes the routing overhead by having a lower cost route maintenance procedure than existing protocols. For reasons referenced in the past section, the proposed protocol is reactive (on-request) in nature, i.e., for their nonexclusive behavior and relatively low control traffic generation tendency. Since LOARP is on-request in nature, it comprises of two protocol activities: Route Discovery and Route Maintenance. The route discovery phase of LOARP is like that of AODV thus we won't go into an excessive amount of subtleties. The route maintenance system of LOARP is a lot less complex than that of AODV, DSR and DYMO [8][9][10]. Communication in any network is typically performed utilizing a layered design called Internet Protocol Suit where each layer takes care of a lot of issues including the transmission of data by using services from the immediate lower layer, and gives a very much characterized service to the prompt upper layer. The routing protocol works at the Network Layer. The routing protocol, LOARP, by observing traffic through this layer can perform route maintenance in an astute path without causing additional overhead. LOARP can move away the issues related with existing route maintenance strategies by checking traffic flow at the network layer. Also, the route is maintained in an end-to-end manner, i.e. only the LOARP running at the source node and the LOARP running at the destination node should be worried about route maintenance. [15]

MLOARP: Proposed

MLOARP overcomes the problems and improve the efficiency in terms of Energy, Delay, throughput and packet drop in underwater acoustic networks. MLOARP is extended and modified from LOARP whereas MLOARP possess tracing the route, route maintenance, route repair; choose the optimal path among multiple paths using PSO algorithm[15][16] and other necessary changes in the MAC, Physical layer settings. The main objective is to characterize the effects of unidirectional route discovery by transmission power uniformity and dynamic irregularities on the network lifetime.

The MLOARP algorithm is coded in NS2 (Aqua-Sim). The performance of this algorithm is verified using various approaches. In the NS2, the working area of this network structure is implicit as 300x300x300 and many numbers of nodes are deployed in the network. The network architecture, nodes and channels characteristics and parameters which are assigned in the TCL code [18][19][20][21].

SIMULATION & ANALYSIS

All simulations are completed by using the Network Simulator (NS2) [12] with an underwater sensor network simulation package (referred as Aqua-Sim). In the simulations, sensor nodes are randomly deployed in a 300m×300m×300m 3-D region. Multiple sinks are randomly deployed on the water floor. While researcher expect that the sinks are stationary when deployed, the sensor nodes obey with the random-walk mobility design. Every sensor node randomly chooses a direction and moves to the fresh new position with a random speed among the insignificant speed and maximal speed, which can be 1 m/s and 5 m/s individually until determined in some other case. In spite of the fact that the supply node can be anyplace in the network, for simple simulations, Researcher locate it at a random position at the base layer in our examination. The data generating rate at the source node is one packet for each second, with a packet size of 100 bytes.

Simulation Software	NS2 version 2.30(Aqua-sim)
Topology size	300m x 300m x 300m
Number of nodes	25,50,100,150,200
Transmission range	120 m
Width	200
Packet size	100 bytes
Simulation time	300 s
Initial Energy	10000
Idle power	0.008
Number of Sink	More than 1

The above table shows the simulation settings. The following graphs enlightens the various investigation of LOARP & MLOARP protocols in UWSN environment.

The figure 1. Shows the MLOARP consume low energy then LOARP in each environment setting. In both protocols the moving nodes require high energy.

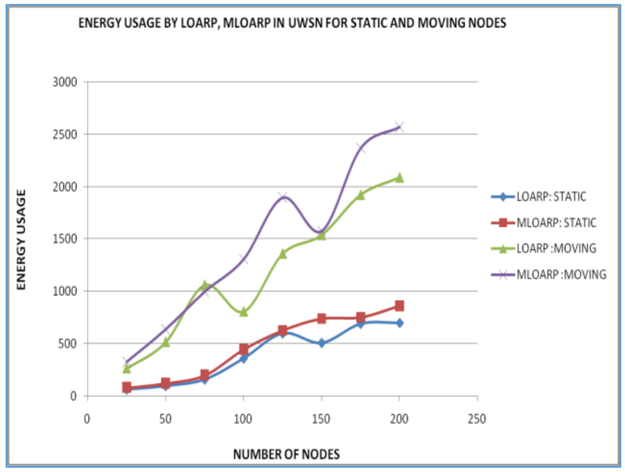

Figure 1. Energy consumed in UWSN using LOARP & MLOARP for Static and Moving Nodes

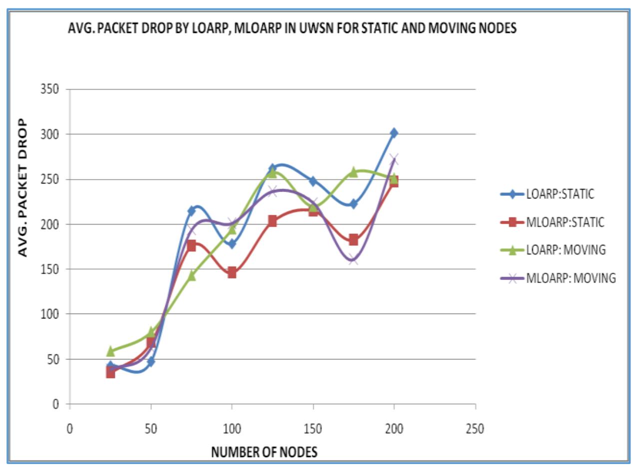

Figure 2. Avg. Packet Drop in UWSN using LOARP & MLOARP for Static and Moving Nodes

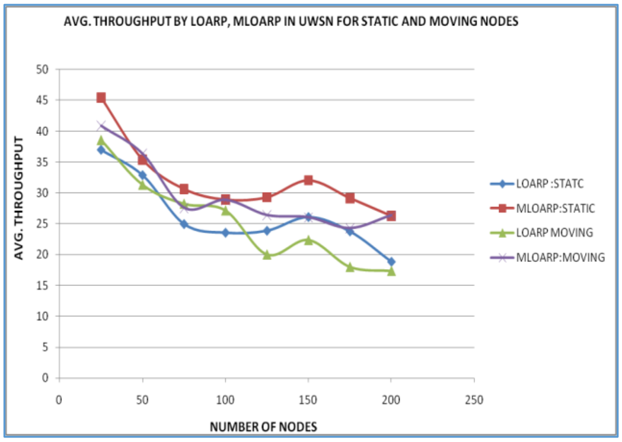

Figure 3. Avg. Throughput in UWSN using for LOARP & MLOARP Static and Moving Nodes

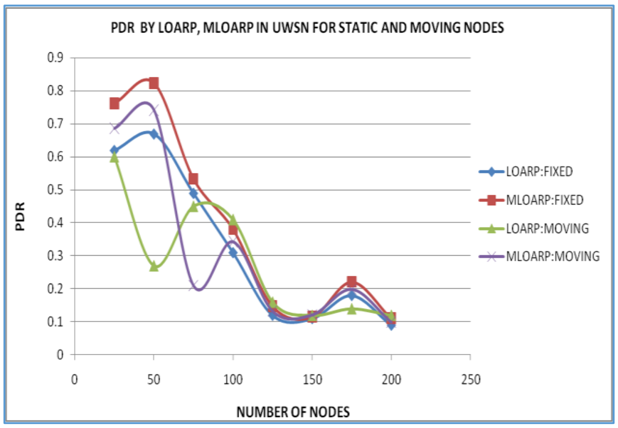

Figure 4. PDR in UWSN using LOARP & MLOARP for Static and Moving Nodes

Form the above figures 2 it is clear that the both protocols perform in a sequential manner, but the proposed make high output for packet drop. In fig.3, 4 the PDR and Throughput are relatively high. So we describe that the MLOARP is performing great then LOARP in throughput and low in packet drop in UWSN communication.

Conclusion

Examination demonstrates that the best PDR, Throughput is accomplished utilizing multiple-path in MLOARP, while LOARP has a superior low. LOARP tries to find the most shortest-path from the source node to the sink, In multiple-sink MLOARP, however, packets can be conveyed to any sink, rather than a static sink as in LOARP. It ought to be noticed that LOARP and MLOARP target different network settings and have very extraordinary network presumptions. LOARP is planned for network communication with a single sink. MLOARP can work in multi-path; it has better execution in single-sink settings and additionally in multi-sink settings. Researcher simply think about some basic cases in which the sinks are randomly, consistently deployed in the water surface. For the proposed routing protocol and the node distribution model, researcher may find better distribution areas for the multi-sinks to achieve better execution.

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