ISSN (Print) : 0974-6846
Indian Journal of Science and Technology, *Vol 9(48), DOI: 10.17485/ijst/2016/v9i48/106804, December 2016* ISSN (Online) : 0974-5645

To increase the efficiency of Underwater Network Using Vector Based Technique

G. Kaur and H. Sharma

Department of Computer Science and Engineering, Lovely Professional University, Jalandhar -144411, Punjab, India; preetshergill7757@gmail.com, himanshu.sharma761@gmail.com

Abstract

For the improvement in underwater acoustic sensor networks, vector based technique is used to increase the efficiency of network and reduce the chances of link failure. It is also improve robustness and scalability of the network. Underwater acoustic are used sensor nodes and autonomous vehicles to communicate from one place to another under the ocean and also used a surface station. They create a link to on-shore control center. UANs are different from terrestrial networks. These are used in different fields like military and commercial fields. Underwater networks are connected with number of vehicles and sensors which are used to monitor the underwater activities. This paper evaluates the research problems of underwater acoustic networks like energy consumption and different layers are used to solve the issues which occur in UANs.

Keywords: Different Layers Design Energy Efficiency Robustness, Scalability,Underwater Acoustic Sensor Networks, Vector Pipeline Technique

1. Introduction

Underwater acoustic networks are used to communicate in the areas of ocean. This is utilized for the long separation arrange for running. UANs (Underwater Acoustic Network) are utilized to set up two methods for acoustic association between many instruments like self-ruling and sensors. To build the operation rang of independent submerged vehicles[3]. In submerged independent vehicles, the correspondence between remote range is constrained by acoustic rang of flag modem. Remote submerged acoustic systems administration is the valuable innovation for some applications. It comprises of various sensors and vehicles that are sent to perform collective checking undertakings over a given range. To accomplish this goal, sensors and vehicles are self-sorted out in a UAN which can adjust to the attributes of the sea environment. In this work many applications of underwater acoustic network are used like communication is better in which the information and signals exchange between communicating nodes. Autonomous Underwater Vehicles (AUVs) are used for the capabilities of underwater networks. The cost of underwater devices is very high, so the missions of monitoring in underwater are expensive. Hence, the reliability of the deployed network is very important, so it can reduce or avoid the failure problem in devices due to underwater monitoring missions[4]. The advantages of underwater sensor networks are robustness, high success of data delivery, energy efficient, low end to end delay, delay efficient, high delivery ratio, high scalability, etc[5]. The capacity is very limited in underwater channel. The network capacity is also influenced by the network topology. The organization of network topology is very important to avoid the communication bottleneck. In underwater acoustic networks, environmental monitoring is important application for monitoring the pollution and it is also used for explorations in underwater. When the pressure of water is high, it is difficult for human but done easily by UANs[4]. It is also used to prevent from Disaster and give information about disasters. It is also by deploying acoustic sensor network in remote locations.

* *Author for correspondence*

1.1 Applications of UANs

1.1.1 Ocean Sampling Networks

Acoustic underwater vehicles and network of sensors are used to perform synoptic, cooperative adaptive sampling for the environment of ocean[10].

1.1.2 Environmental Monitoring

The Underwater acoustic sensor networks are used to monitor the pollution such as chemical, nuclear and biological in the oceans. It is used to monitor the chemicals of antibiotics, monitor streams for insecticides; it monitors the chemicals in oceans, lakes, rivers, checks the quality of the water. It is used to improve the forecasting in weather, used to detect the change in climate, monitor the winds, etc in oceans. The biological monitoring is used to monitoring fishes or tracking of micro-organisms and other different applications. The UW-ASNs are also used to monitor the temperature in oceans.

1.1.3 Undersea Explorations

The UANs are used in undersea explorations. It is used to help in undersea explorations such as tracking the underwater reservoirs or oilfields, determine routes for undersea cables and also used to detect the valuable minerals in oceans.

1.1.4 Disaster Prevention

It is used to prevent from disasters. It is used to detect the locations which can provide information about tsunamis, floods, earthquakes, etc. to coastal areas.

1.1.5 Assisted Navigation

The sensor networks are used to identify or sense the dangerous rocks or shoals in under the oceans; it is also used to monitor the positions submerged wrecks, and to perform bathymetry profiling.

There are some challenges in the design of underwater acoustic networks like:

- In UANs Propagation postponement is five requests of greatness higher than in radio recurrence earthly channels, and amazingly factor[6].
- The data transmission which is accessible is exceptionally constrained in UANs.
- Because of multi-way and blurring the underwater acoustic channel is extremely hindered.
- Underwater acoustic sensor organizes, the battery power is constrained. So we need to make them vitality effective. To diminishes the fouling from submerged sensors.
- Because of the outrageous qualities of the acoustic channel High bandwidth rates and brief misfortunes of availability can be experienced.

2. UAN Research

In research of UAN Network topology, the MAC layer, Network layer, physical layer and application layer are 4 different issues.

2.1 Network Topology

UAN system is not quite the same as other earthbound systems because of the qualities of acoustic Signal and submerged channels are special than others. Be that as it may, both systems are utilized for expanding the limit of system and solid availability. The associations between many systems are known as system topology. Arrange topology has two fundamental sorts are specially appointed mode and the pecking order mode[1]. In impromptu mode, the hubs are self composed as distributed system. Be that as it may, in progression arrange topology a few levels of structure are conveyed.

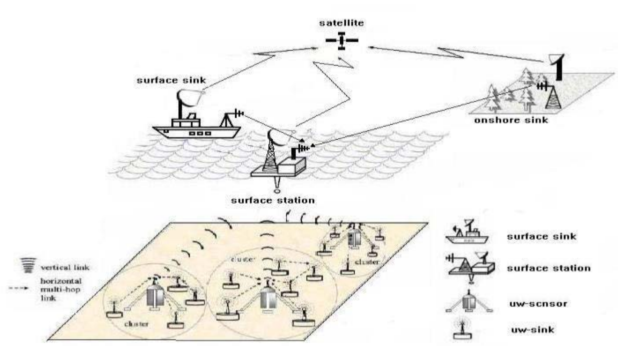

Figure 1. Hierarchy topology.

2.2 MAC Layer

In MAC layer, the bundles of system are move starting with one layer then onto the next layer. Submerged hubs have the data transfer capacity is restricted, long deferral and it is utilized to share the assets which are accessible in the system. Medium get to control layer is utilized to get to the underwater acoustic channel[7]. MAC layer is utilized to plans every hub to get to physical medium. Macintosh layer likewise setup a few parameters and decide assets that physical layer could have.

2.3 Network Layer

Network layer is utilized to convey and impart data to the utilization of courses. It is mindful to send parcels and the directing bundles contain the data about way between sender hubs to goal hub. It is utilized two sorts of steering strategies are virtual circuit directing and parcel switch directing. In virtual circuit directing, the virtual circuits are utilized to choose the way amongst sender and recipient[8]. In bundle switch steering, each hub has possess directing choices which are a piece of transmission. The bundle exchanging directing has encourage two sorts are proactive steering and receptive directing.

2.4 Physical Layer

Physical layer is utilized connection or associate with essential equipment and transmission innovations of equipment. UANs are special due to channel of physical[2]. For underwater acoustic channel electromagnetic wave band have high constriction yet experience just little parts of long-wave groups. So here we require an extensive reception apparatus and high transmission control[10]. The correspondence is done in submerged with acoustic flag since acoustic signs can goes at long separation in submerged travels. It is very useful layer in UAN.

2.5 Application Layer

Application layer is utilized to give the system administration convention. This layer is utilized for the dividing of issues and distribution of assets[10]. It is additionally use for Synchronizing correspondence. This layer is accustomed to recognizing the asset accessibility and distinguishing correspondence accomplices.

3. Architecture of UAN's

There are numerous unsolved issues in underwater acoustic systems. UANs are Different from terrestrial systems[9]. The transfer speed of UANs is constrained as contrast with ground based or earthly systems .In the acoustic networks, the recurrence is high and having high rang. UANs additionally have long advance deferral. In Acoustic flag, the speed of transmission is around 15000m/s which is lower than electromagnetic Wave, it's encouraging is deferred. In UANs causes likelihood of high blunder bit rate. In UANs, the cost of assembling, sending, and recuperation and kept up is high as contrast with ground based systems. UANs are utilized to outline for the long time work and it additionally used to spare vitality.

4. Proposed Work

Cross layer approach is proposed for underwater networks, it is used to increase the efficiency of network. Here a joint plan of various systems which is utilized to build the odds of sharing data and diminish the odds of connection disappointment in UANs between various layers. Environment in underwater areas is changed because of the financial issues and UNA have ability to modify itself for that environment. The convention outline and topology ought to have the capacity to self-versatile in cause if environment changes. In the convention outline of UANs the proficiency of vitality issue is constantly considered.

5. Simulations

Robustness, scalability and energy efficiency are major issues in underwater sensor networks (UWSNs). High idleness, low data transfer capacity, high mistake Probability, hub skim versatility is the things that differenced the UWSNs from earthly sensor arrange. There are still many difficulties to the system convention plan of UWSNs. Vector based sending convention give hearty, versatility and vitality productive steering. It is an area based approach in which no state data is required on the sensor hub and the bundles are sent in interleaved way which is increment the heartiness in VBF[8]. Here we build up the self-appropriation calculation which improves the execution of VBF. This calculation permits hubs to decrease vitality utilization and forward parcels by disposing of the low advantage bundles. We assess the outcomes on reproductions. Our outcomes for system with medium or little hub versatility (1 m/s-3 m/s), and it demonstrates the upgrade in high accomplishment of information conveyance, vitality proficiency and strength.

6. Performance Evaluations

We used simulation in NS-2 to evaluate the performance. First we implement MAC protocol and then define methodology of simulation. We evaluate the effect of routing pipe radius, node density, nodes mobility on VBF.

6.1 Implementation of MAC protocol

VBF performance can affect by underlying MAC protocol. To evaluate its execution firstly we actualize CSMA based MAC convention which just bolster show. It detects the channel to send bundles and it use back-off calculation in cause if channel is occupied. It can utilize most extreme 4 back-offs. This convention has no ACK and impact discovery. From our implementation we measure end-to-end delay, energy consumption and packet delivery ratio of VBF. Every sender defers its sending time to diminish the impact of parcels. The information rate of MAC convention is set to 500 kbps.

6.2 Impact of the Routing Pipe Radius

The 50 nodes are connected in the network at fixed speed 3m/s. The radius changes from 0 meter to 600 meters and speed is fixed at 0m/s to 3m/s.

Figure: 1.1. It is used to represent just a position between the overall, old and the new throughput. And as we can clearly see that the packet delivery in the new applied technique is high right from the early start of the transmission, hence we can say that the by applying concepts of clustering, state management and node mobility. We can have an efficient underwater network.

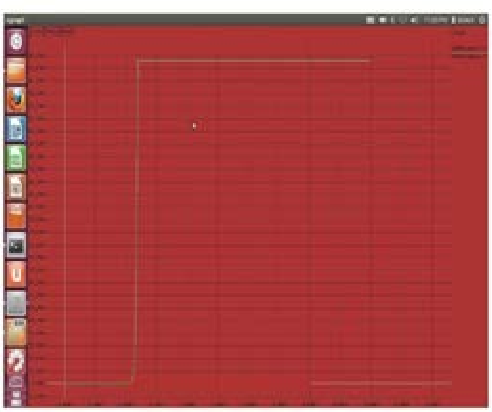

Figure 1.1. Throughputs.

A common presumption in case of underwater networks is that it is more reliable and it implies the consumption of energy is very high; the nodes are faced problems in applications which operated in underwater. In underwater, recharging batteries is very difficult task it is very hard to recharging or replacing batteries.

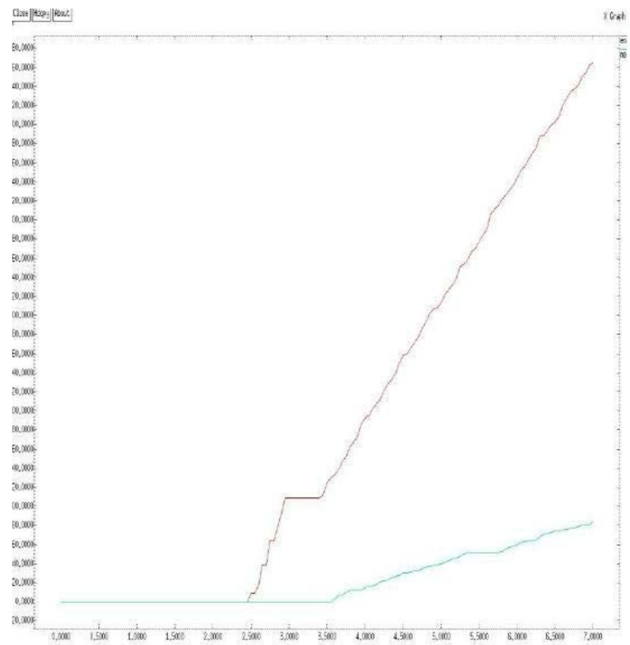

Figure 1.2. Energy Usage.

Here in Figure 1.2, we can see that without implementing the concept of VBF or node mobility the battery/energy consumption is relatively higher than that of while implementing the same. In the figure, the red line depicts the energy consumption rates without taking into concern the node mobility and the green line represents the new energy usage graph.

7. Conclusions

In this work, it has been concluded that vector pipelining is the efficient technique for data routing in underwater acoustic networks. In vector pipelining whole network is divided into segments and data will be routed from one segment to another. Due to high waves in the network, the chances of link failure are very high. In this work, improvement is proposed in vector pipelining technique to reduce chances of link failure in network. This will leads to improvement in network performance in terms of energy consumption, packet loss and throughput.

8. References

1. Akyildiz, Pompili D, Melodia T. Underwater acoustic sensor networks: Research challenges. Elsevier. Journal of Ad Hoc Networks. Feb 2005; 3(3)257–79.
2. Quazi A,Konrad W.Underwater acoustic communications. IEEE Commununication Magazine. Mar 1982;24–9.
3. Butty an L, Holczer T.Private Cluster Head Election in Wireless Sensor. 6th International Conference on Mobile Adhoc and Senor Systems. IEEE; 2009..
4. Chitre M, Freitag L, Sozer E, Stojanovic M. Architecture for Underwater Networks.. IEEE Journal of Oceanic Engineering. 2007;
5. Chitre M, Freitag L, Sozer E, Stojanovic M, Shahabudeen S. An Architecture for Underwater Networks. OCEANS 2006. IEEE, 1–6.
6. Zhang C, Zhou MC, Yu M.Ad hoc Network Routing and Security: A Review. International Journal of Communication Systems. Aug 2007; 20:909–25.
7. Ethem MS, Stojanovic M, Proakis JG. Underwater Acoustic Networks. IEEE Journal of oceanic engineering. January 2000. 25(1).1
8. Schill F, Zimmer UR, Trumpf J.Visible Spectrum Optical Communication and Distance Sensing for Underwater Applications.Proceedings of Australasian Conference of Robotics and Automation, Canberra, Australia. Dec, 2004.
9. International Journal of Scientific and Engineering Research. July 2011; 2(7).
10. Akyildiz IF, Pompili D, Melodia T.Underwater acoustic sensor networks: Research challenges. Ad Hoc Networks (Elsevier). March 2005; 3(3):257–79, March 2005.