COLLISION TOLERANT AND COLLISION FREE PACKET SCHEDULING FUNCTION OF NETWORK LAYER FOR UNDER WATER NOISE

[1]MUDDASANI SHRAVANI, P.SWETHA NAGASRI, T.ASWANI
[1]Assistant Professor, [2]Assistant Professor, [3]Assistant Professor
Computer Science &Engineering
Malla Reddy College Of Enginering For Women, Hyderabad, India

Abstract – This paper proposed the combination of Collision tolerant and collision free packet scheduling Function of Network layer for under water noise. Goal is to utilize the functions of the network layer for reducing the collision tolerant and collision free packet under the water noise.

Keywords: network, water noise, network layer, packet, collision

I. INTRODUCTION

Wireless information transmission through the ocean is one of the enabling technologies for the development of future ocean-observation systems and sensor networks. Applications of underwater sensing range from oil industry to aquaculture, and include instrument monitoring, pollution control, climate recording, prediction of natural disturbances, search and survey missions, and study of marine life.

Underwater wireless sensing systems are envisioned for stand-alone applications and control of autonomous underwater vehicles (AUVs), and as an addition to cabled systems. For example, cabled ocean observatories are being built on submarine cables to deploy an extensive fibre-optic network of sensors (cameras, wave sensors and seismometers) covering miles of ocean floor [1]. These cables can support communication access points, very much as cellular base stations are connected to the telephone network, allowing users to move and communicate from places where cables cannot reach. Another example is cabled submersibles, also known as remotely operated vehicles (ROVs). These vehicles, which may weigh more than 10 metric tones, are connected to the mother ship by a cable that can extend over several kilometers and deliver high power to the remote end, along with high-speed communication signals. A popular example of an ROV/AUV tandem is the Alvin/Jason pair of vehicles deployed by the Woods Hole Oceanographic Institution (WHOI) in 1985 to discover Titanic. Such vehicles were also instrumental in the discovery of hydro-thermal vents, sources of extremely hot water on the bottom of deep ocean, which revealed forms of life different from any others previously known. The first vents were found in the late 1970s, and new ones are still being discovered. The importance of such discoveries is comparable only to space missions, and so is the technology that supports them.

Among the first underwater acoustic systems was the submarine communication system developed in the USA around the end of the Second World War. It used analogue modulation in the 8–11 kHz band (single-sideband amplitude modulation). Research has since advanced, pushing digital modulation–detection techniques into the forefront of modern acoustic communications. At present, several types of acoustic modems are available commercially, typically offering up to a few kilobits per second (kbps) over distances up to a few kilometres. Considerably higher bit rates have been demonstrated, but these results are still in the domain of experimental research (e.g. [8,9]).

With the advances in acoustic modem technology, research has moved into the area of networks. The major challenges were identified over the past decade, pointing once again to the fundamental differences between acoustic and radio propagation. For example, acoustic signals propagate at 1500 m s−1, causing propagation delays as long as a few seconds over a few kilometres. With bit rates of the order of 1000 bps, propagation delays are not negligible with respect to typical packet durations—a situation very different from that found in radio-based networks. Moreover, acoustic modems are typically limited to half-duplex operation. These constraints imply that acoustic-conscious protocol design can provide better efficiencies than direct application of protocols developed for terrestrial networks (e.g. 802.11 or transmission control protocol (TCP)). In addition, for anchored sensor networks, energy efficiency will be as important as in terrestrial networks, since battery re-charging hundreds of metres below the sea surface is difficult and expensive. Finally, underwater instruments (sensors, robots, modems and batteries) are neither cheap nor disposable. This fact may be the single most important feature that (at least for now) distinguishes underwater sensor networks from their terrestrial counterpart, and fundamentally changes many network design paradigms that are otherwise taken for granted.

While today there are no routinely operational underwater sensor networks, their development is imminent. Applications that motivate these developments are considered in §2. The underlying systems include fleets of cooperating autonomous vehicles (where vehicles have the capability to respond to one another, not only to the supervisory commands from a central authority that amounts to ‘switch from mission A to mission B’), and long-term deployable bottom-mounted sensor networks. Active research that fuels this development is the main subject of our paper. In §3, we describe key technical issues and new research approaches that come from revising traditional assumptions and exploiting cross-layer optimization both between adjacent layers and throughout the entire protocol stack, from the application to the physical link. We also describe the currently available hardware, and discuss tools for modelling and simulation, as well as testbeds.

1. Underwater sensing applications

The need to sense the underwater world drives the development of underwater sensor networks. Applications can have very different requirements: fixed or mobile, short or long-lived, best-effort or life-or-death; these requirements can result in different designs. We next describe different kinds of deployments, classes of applications and several specific examples, both current and speculative.

II. SYSTEM MODEL

We consider a UASN consisting of M underwater nodes and N anchors as shown in Fig. 1. Each anchor in the network encapsulates information about its ID, its location and time of transmission into a localization packet, which is broadcast to the network based on a given protocol, e.g., periodically or upon the reception of a request packet from a sensor node [10]. The following assumptions hold in the network model.

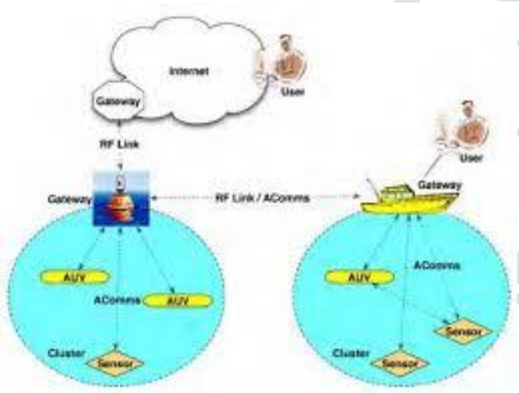

Fig. 1 M underwater nodes and N anchors

• The anchors are roughly synchronized with each other; however, the sensor nodes may not be synchronized with the anchors. This is a reasonable assumption because anchors are usually located on the surface and can be equipped with a GPS. It should be noted that no synchronization is needed when anchors use an on-demand packet transmission protocol, i.e., when an underwater node initiates the localization protocol, and the anchors are notified after reception of the transmitted packet.

• Anchors and sensor nodes are equipped with half-duplex acoustic modems, meaning they cannot transmit and receive simultaneously.

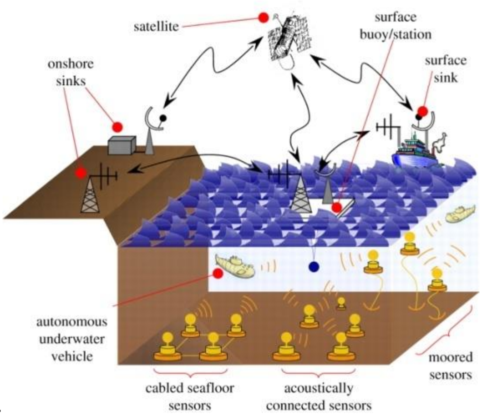

Fig. 2. Anchors and sensor nodes are equipped with half-duplex acoustic modems

• Sensor nodes are located randomly in an operating area according to some probability density function We assume that the distance d between a sensor node and an anchor is distributed.

• Although the concept of this article can be extended to a multi-hop network, in this work we consider a

Single-hop network where all the nodes are within the communication range of each other. In addition, it is assumed that in the absence of packet collision, the probability of the packet loss between an anchor and a sensor node is pl.

III. PREVIOUS WORK

As the transmission costs great energy in UWSNS all existing MAC approaches try to avoid packet collisions, and can be further divided into three categories:

(1) contention-based MAC without rts/cts,

(2) contention-based MAC with rts/cts, and

(3) contention-free MAC.

Contention-based MAC without rts/cts: this kind of protocol is a modified aloha protocol. A short tone or preamble is used as transmitting notification to neighbor nodes. When a node hears the transmitting notification of other nodes, it will back off its own transmission randomly [9] or reschedule its own transmission based on the knowledge of all its neighbors' notification [10]. However, such a notification scheme wastes channel bandwidth and energy.

Contention-based MAC with rts/cts: this kind of protocol exploits virtual carrier sense to save energy and avoid conflicts. Nodes pick up with data information in control packets to help other nodes in calculating the "busy time" of a channel, and stop listening in this period of time [11]. Due to the long propagation delay in underwater environments, sensor nodes must wait for the long round-trip time of rts/cts exchange, and cannot send any data. In order to decrease the waiting time, these works further exploit the idle period of rts/cts exchange to send data packets or other rts messages if they would not collide with rts/cts.

Contention-free protocols: several works have shown that, due to the long propagation delay in underwater environments, it is difficult for the contention-based schemes to approximate the optimal energy-efficient MAC in UWSNS Hence, contention free approaches such as FDMA CDMA or TDMA have attracted much attention. FDMA divides the frequency band into several sub-bands, however, the narrow band of the underwater acoustic channel results in a low throughput (e.g., 50 bits/s) [11]. CDMA approaches have been proposed [11], however, they have an inherent near-far problem which cannot be well addressed, especially for the long propagation delay and long communication range of UWSNS.

Therefore, TDMA protocols have attracted a lot of attention, falling into two categories: one-slot approaches and multi-slot approaches. One-slot approaches require that the transmission must be accomplished in a single slot, so the length of a time slot is at least one frame time plus the longest propagation delay of all links in the transmission range [6]. Paper [9] proposes a TDMA scheduling scheme for mobile underwater sensor nodes using an adaptive token polling, and paper [10] suggests a method that decreases energy consumption and propagation delays caused by channel collision by solving some problems of UWSNS-MAC, which occur when the number of nodes increases. St-MAC is the first multi-slot TDMA protocol especially designed for UWSNS [8], which allows more than one slot to accomplish the transmission of one packet between two neighbors. St-MAC exploits a centralized algorithm on the spatial-temporal conflict graph to assign time slots for every node. In order to keep the condition that propagation delay of each link must be integral multiple of one slot; the frame size must be designed as small as possible.

Contention based MAC approaches will cause energy wasting because of data collisions, and scheduling schemes are almost always based on time slots. They all ignore the feasibility of allocating transmission moments on a continuous time axis without slotting, which could further improve channel utilization and network throughput.

DESIGN OF ECS

In this section, we first demonstrate our metrics to design ecs in underwater environments and present the conflict model based on continuous time. Then we introduce the exact design of ecs and present basic ideas of ecs via an example. Finally we give maintenance schemes to deal with the cases of node death or joining in the network.

IV. CONCLUSION

This paper gives the idea of complete view of the present combination of collision tolerant and collision free packet scheduling function of network layer for under water noise in network layer and routing layers. The interaction of these layers is essential in order to advance the research and development of network layer

V FUTURE SCOPES

As part of future scope the paper gives along with the network layer ,data link layer and session layer also can reduce the noise of the of collision tolerant and collision free packet scheduling.

References

[1].tunnicliffe v., barnes c., dewey r. (2008) major advances in cabled ocean observatories (venus and neptune canada) in coastal and deep sea settings. Ieee/oes us/eu-baltic int. Symp., tallinn, estonia, may 2008, 1–7, ieee.google scholar

[2].farr n., bowen a., ware j., pontbriand c., tivey m. (2010) an integrated, underwater optical/acoustic communications system. In ieee oceans conf., sydney, australia, may 2010, 1–6, ieee.google scholar

[3].vasilescu i., kotay k., rus d., dunbabin m., corke p. (2005) data collection, storage, and retrieval with an underwater sensor network. In proc. 3rd acm sensys conf., san diego, ca, november 2005, 154–165, acm.google scholar

[4].cella u. M., johnstone r., shuley n. (2009) electromagnetic wave wireless communication in shallow water coastal environment: theoretical analysis and experimental results. In proc. 4th acm int. Workshop on underwater networks (wuwnet), berkeley, ca, november 2009, 9:1–9:8, acm.google scholar

[5].friedman j., torres d., schmid t., dong j., srivastava m. B. (2010) a biomimetic quasi-static electric field physical channel for underwater ocean networks. In proc. 5th acm int. Workshop on underwater networks (wuwnet), woods hole, ma, september 2010. Acm.google scholar

[6].urick r. (1983) principles of underwater sound (mcgraw-hill, new york, ny).

[8].carrascosa p. C., stojanovic m. 2010 adaptive channel estimation and data detection for underwater acoustic mimo ofdm systems ieee j. Oceanic eng. 35 635 646 doi:10.1109/joe.2010.2052326 (doi:10.1109/joe.2010.2052326)crossrefweb of sciencegoogle scholar

[9].roy s., duman t., mcdonald v. 2009 error rate improvement in underwater mimo communications using sparse partial response equalization ieee j. Oceanic eng. 34 181 201 doi:10.1109/joe.2009.2014658 (doi:10.1109/joe.2009.2014658)crossrefweb of sciencegoogle scholar

[10].fairley p. 2005 neptune rising ieee spectr. 42 38 45 doi:10.1109/mspec.2005.1526903 (doi:10.1109/mspec.2005.1526903)crossrefgoogle scholar

[11].akyildiz i., pompili d., melodia t. 2005 underwater acoustic sensor networks: research challenges ad hoc netw. 3 257 279 doi:10.1016/j.adhoc.2005.01.004 (doi:10.1016/j.adhoc.2005.01.004)

[12].http://www.mdpi.com/1424-8220/11/3/2920/htm

[13].http://www.mit.edu/~millitsa/resources/pdfs/mandar.pdf

[14].file:///c:/users/cse%20hod/downloads/sensors-14-00795%20(1).pdf