Cluster-Based Multi-attribute Routing Protocol for Underwater Acoustic Sensor Networks

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Abstract

Underwater Acoustic Sensor Networks play a significant role in various underwater applications. There are several challenges in underwater communications like high bit-error-rate, low bandwidth, high energy consumption, void-node during routing, etc. Handling void-node during routing is a major challenge in underwater routing. There are well-known void-handling protocols like Energy-efficient Void-Aware Geographic Routing protocol, HydroCast, etc. However, these routing protocols require all neighboring nodes must be a part of the cluster which increases the overhead on clustering, or void-node has a part of the routing. This paper proposes an underwater routing protocol referred to as Cluster-based Multi-Attribute Routing (CMAR) to overcome these issues. It is a sender-based, opportunistic underwater routing protocol. CMAR uses the Technique for Order of Preference by Similarity to Ideal Solution to evaluate the suitability of the neighboring nodes and the basis for clustering process initialization. Through MATLAB simulations, the performance of the CMAR is compared with HydroCast in terms of the number of nodes selected in the forwarding set, number of clusters formed, number of times void-node becomes part of routing and transmission reliability.

Keywords Underwater routing · Clustering · MADM · TOPSIS

1 Introduction

Water covers the majority portion of the surface of the earth. Exploring underwater is a growing field of research in communication. Underwater Acoustic Sensor Networks (UASNs) are the technology that enables exploring of underwater. UASNs have several applications such as underwater environment monitoring, underwater resource exploration, detection of various underwater disturbances, underwater surveillance, the study of marine

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