Chapter Nine - Explorative analysis of AUV-aided cluster-based routing protocols for Internet of intelligent underwater sensors

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Contemporary innovations in underwater acoustic technology (UAT), smart systems (SS), vehicular ad-hoc networks (VANET), micro-electromechanical systems (MEMS), and artificial intelligence (AI) coupled with recent advancements in the field of Internet of underwater things (IoUT) have led to the development of interesting engineering solutions for underwater sensor networks (UWSN). UWSN performs collaborative event observation for adaptive decision-making through a specialized network of submerged sensors, surface sinks, and coastal base station by relying on interactive communication, intelligent computing, and smart sensing. UWSN is obviously a critical and essential asset for smart cities (SC) and because of the explosive potential of UWSN technology; it has been garnering increasing attention from academic researchers and industrial experts in various fields. However, the performance of UWSN applications is limited due to issues closely tied to the underwater environment such as surface noise, narrow bandwidth, long propagation delays, high-temperature gradients, biofouling, corrosion, and erratic water current activities. These issues lead to high-energy consumption, high deployment costs, rapid route failures, frequent retransmissions, low reliability, and other challenges that have instigated UWSN researchers to proffer solutions in the form of different routing protocols. Cluster-based routing (CBR) is one of these proposed solutions where the network adopts a dynamic hierarchical process of logically grouping the nodes into cluster heads (CHs) and cluster members (CMs) with respect to well-defined performance indicators. Researchers have also established that CBR protocols are relatively more versatile and capable of yielding better performance in terms of fault tolerance, resource awareness, and route efficiency for large-scale UWSNs. This chapter, therefore, discusses the architecture, network model, and technical features of AUV-aided water quality monitoring (WQM) as a target application for the Internet of intelligent underwater sensors. This research furthermore conducts an explorative analysis of state-of-the-art CBR protocols for UWSNs. This work conducts simulation-based network and statistical analysis to provide useful technical insights on the performance analysis of selected CBR protocols.

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