

Project Proposal: Distributed System for environmental monitoring

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15th November, 2023

1 Introduction

The aim of the project is to develop a distributed system dedicated to monitoring and computing the average height of waves in the ocean. The objective is to issue a warning if the wave heights surpass a predefined threshold. Employing a peer-to-peer architecture, the system incorporates multiple wave height sensors. The primary goal is to create a robust and scalable distributed system, using a decentralized approach exemplified by oceanic monitoring.

2 Project Requirement Analysis

2.1 Dynamic Discovery

The peer-to-peer network will support dynamic sensor discovery, allowing seamless addition or removal of sensors (participants) without central coordination, using UDP Broadcast.

2.2 Fault Tolerance

Neighboring wave sensors monitor each other's status by exchanging heartbeats using TCP Unicast. The fault tolerance mechanism requires at least 3 participants to be operational to calculate the average wave height. If the number is below 3, the system waits for a new participant to join. Every participant keeps a copy of the average wave height.

2.3 Voting

A voting mechanism will be implemented among participants to determine the leader sensor (host) responsible for aggregating wave height values and calculating the average. In case the leader leaves the system, a new leader will be chosen. Participants will collaboratively vote on selecting the leader, ensuring a decentralized decision-making process.

2.4 Reliable Multicast

Average wave height readings will be shared by the leader among participants, ensuring synchronization across the decentralized network. If the average wave height exceeds a certain threshold, a warning is displayed. Each participant is capable of both receiving and transmitting data.

3 Architecture Diagram

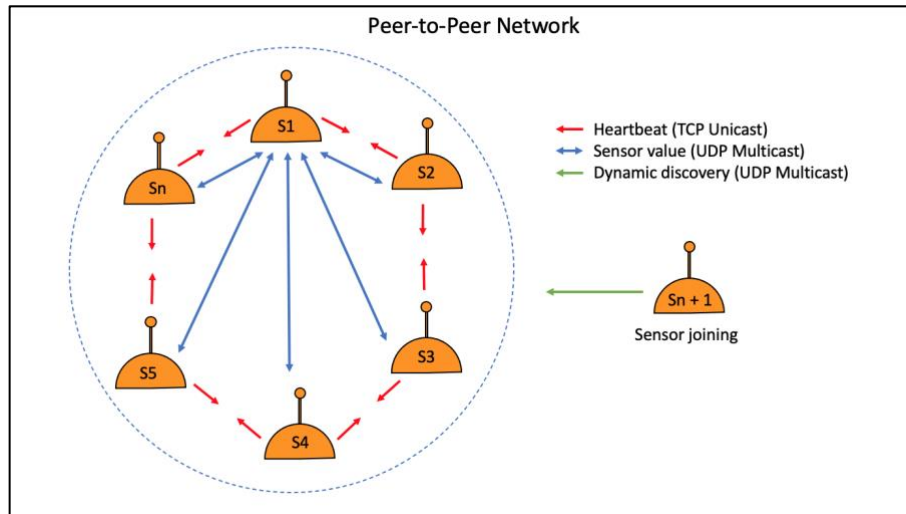


Fig. 1: Peer-to-Peer Network example: diagram environmental monitoring