

Cluster Base Network: A Neighborhood Watch Approach

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Abstract

Sensors can significantly impact one's life, they can be used to measure various phenomena such as CO₂, temperature, chemicals, water quality, etc. They can also be used in surveillance situations. The data collected by the sensors is processed into information from which decisions are made. Faulty information could cause severe problems. For example, a CO₂ sensor with a low battery charge may trigger a false CO₂ alarm, causing emergency personnel to respond, thus causing a temporary shortage of personnel able to respond to real emergencies. This situation is exacerbated in a sensor network where data collected is highly sensitive and decisions are important. Furthermore, sensor networks are ad-hoc in nature, with no central authority to analyze network behavior. A goal of our research is to construct energy efficient mechanisms that increase the integrity of the data collected within the sensor network in the presence of potential malicious behavior, sensors with weakened battery power, and/or faulty sensors. A mechanism that we have used in our research is a cluster-based approach. Here the ad-hoc network is partitioned into small clusters. Data collection, communications and processing can be observed by cluster members. The cluster members can police each other, assessing the trustworthiness of each member and collectively signing this assessment. Thus sensors can act as neighborhood watch in a large city, in the sense neighbors watch each other's house to protect each other and enhance the security of the neighborhood. In this research, we developed an energy efficient network protocol that constructs clusters without the use of a central authority. We have also constructed an energy efficient protocol for a cluster to assess members' trustworthiness and mechanisms that allow the cluster to sign this assessment.

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