



Review

A survey on cross-layer solutions for wireless sensor networks

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ABSTRACT

Ever since wireless sensor networks (WSNs) have emerged, different optimizations have been proposed to overcome their constraints. Furthermore, the proposal of new applications for WSNs have also created new challenges to be addressed. Cross-layer approaches have proven to be the most efficient optimization techniques for these problems, since they are able to take the behavior of the protocols at each layer into consideration. Thus, this survey proposes to identify the key problems of WSNs and gather available cross-layer solutions for them that have been proposed so far, in order to provide insights on the identification of open issues and provide guidelines for future proposals.

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1. Introduction

Wireless sensor networks (WSNs) have presented interesting and challenging issues since their creation. These networks have been drawing even more attention lately, mainly because of the plethora of different applications that have been emerging. Thus, they are the aim of many optimization proposals, and the cross-layer approaches have proved to achieve better optimization results than their layered counterparts. As several proposals have

the same objectives, their efficiency comparison becomes important, and also as they consider different approaches, it is possible to discover which ones result in more gains to networks, avoiding complicated computation and excessive overhead. Furthermore, the mission of the WSN must be considered by the optimization proposal since, for instance, throughput maximization is not as important for an electrocardiogram (ECG) application as it is for video transmission. Finally, a look at the past of sensor networks can reveal the issues as they appeared, and also provide insights for the future challenges.

The first sensor networks have not considered wireless communication (Kohno et al., 1999). Moreover, wired systems have their own wired power supply, so energy consumption was not an issue at that time. The main concerns at the second-half of the

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