I. INTRODUCTION

Wireless sensor networks (WSN) consist of a large number of potential heterogeneous sensor nodes, interconnected by means of optimized wireless communication links. Often times, these networks use a hierarchical approach with a dedicated sink node which serves as an interconnection between the resource constrained remote wireless sensor network and the more powerful back-end applications. To enable intelligent monitoring and data management in such an environment, we have developed a fully distributed ontology-based aggregation framework. This framework has been deployed and evaluated on the WiLab.t wireless sensor and mesh network testbed. However, because of the adoption of a generic ontology approach, the framework could be used on other real life WSNs as well. Apart from offering different kinds of information, the ontology-based approach also allows classification and inference to be performed on the gathered data. As such, only important conclusions are exposed to the back-end application. Additionally, extra precautions have been taken to minimize the network usage between the remote sink node and the back-end services.

II. ARCHITECTURE

Our general ontology-based monitoring approach has already been thoroughly evaluated in a back-end heavy-duty environment [1], [2]. However, because of the constrained environments taken into account in this scenario, we have had to define a number of additional modules and enhance certain mechanisms, in order to facilitate the deployment of the platform. We have developed specific components to enable data aggregation on the sensor nodes, and enable description logics (DL) reasoning on the sink nodes. Additionally, the scheduling component has been extended with algorithms to minimize the network usage between the back-end services and the remote sink node. For this, it uses self-learning mechanisms, i.e. depending on the previous executions of given DL-reasoning tasks, it will deploy the approach optimizing network consumption.

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