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UML Based Modeling for Data Aggregation in Secured Wireless Sensor Network

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Abstract

Up till now, less research has been done in developing a Wireless Sensor Network (WSN) data aggregation with the help of Object Oriented Modeling and Design (OOMD). These kinds of applications include use of complex data structures and different algorithms for aggregating data. Usually for such calculation, mathematical modeling is done. To visually represent any research problems, Unified Modeling Language (UML) is more efficient tool for modeling. In this paper, demonstration of UML diagrams is presented for modeling of data aggregation in WSN which leads to better development of application. As a result of additional sensor nodes being deployed in the wireless sensor networks, demand on resource constraints is reduced, which leads to increase in redundant data. Data aggregation protocol helps to reduce this redundancy by organizing the data efficiently. Due to the constraints on energy in the WSNs, use of data aggregation techniques and data dissemination across WSN plays a significant role in the network life cycle time as they help to conserve the energy of sensor nodes. In this, data is collected by sensor node, then dedicated cluster node aggregates it with data aggregation algorithm and then it is forwarded to base station. This flow of various activities is modeled using UML diagrams. Heresystem is analyzed with the help of use case diagram, class diagram, sequencediagram, collaboration diagram and activity diagram. Modeling this kind of problems using UML approach helps to visualize, specify, construct and document the system artifact effectively which is helpful for various stakeholders of the application.

Keywords: WSN; Data Aggregation; Cluster; Cluster Head; UML; OOMD;
1. Introduction

WSN has small sensor nodes also called as motes. It has various capabilities like information sensing, computation, high-speed communication and result generation. In various application sensors are deployed and they collect environment information (for example temperature, humidity) from all sensors which is in turn send to the base station. WSN generates a huge data which need to be aggregated at various different levels. To examine the performance of a sensor network, bandwidth, signal strength, memory, battery power etc. have been utilized; its efficiency can be improved by reducing the cost of cluster development. The basic requirement and challenge of data gathering task is sensor energy conservation so that its lifetime is increased.

Modeling activity is at the centre of Software Development Life Cycle (SDLC) which leads to better application development and reusability. The Unified Modeling Language (UML) is a graphical language which is effective for visualization, specification, construction, and documentation of a software-intensive system’s artifact. The UML provides a standard practices for writing a blueprint of system. It covers various conceptual things, such as system functionality through use cases and business processes. It also covers concrete things like database schema, reusable component, classes which are written in a specific programming language[1]. This paper mainly focuses on how to follow and apply process of formal development with UML in WSN data aggregation which is based on the OOMD.

2. Related Work


3. UML Applications in various domains

The UML effort started in October 1994 officially with fusion of Booch, Jacobson's OOSE (Object-Oriented Software Engineering), and Rumbaugh's OMT (Object Modeling Technique) approach. After its introduction, UML has been universally adapted and used by the community of software development. It is because of models help to depict graphically, specifying, constructing, and documenting the artifacts of a software-intensive system.

It facilitates comprehensible modeling techniques to describe system models and used for various applications, ranging from engineering modeling to business processes, mainly for documentation purposes.

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