



LIFETIME MAXIMIZATION PROTOCOL FOR ENERGY-EFFICIENT WIRELESS SENSOR NETWORKS

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Abstract

Virtualization of resources is gaining much more importance in the field of communication for better Resource utilization. As Wireless Communication sensor Network is a multilevel structure, whether the virtual concept can be applicable to these multilevel WCSN and whether it improves the performance, functionality & lifespan of a network or not, that have to be analyzed. This paper evaluated the performance of virtual concept in each layers of WCSN, and analysis shows that, the virtual concept based designing of WCSN improves the functionality in terms of energy utilization, Quality of service parameters and ultimately life span of a Wireless Communication Sensor Network, also provides better structural optimization of Network. In this paper scope of the thesis is restricted to comparative analysis based on basic simulation of wireless communication sensor network with the consideration of power allocation methods is done along with cost estimation based on direct and shortest path transmission, virtual channel based concept ,clustering methods, virtual cluster head based designing, formation of virtual cluster of cluster heads, structural optimization of wireless communication sensor network for critical event and Virtual Network based data gathering Scheme for supporting virtual network infrastructure.

Keywords: “Virtual Sensor Network, Wireless Communication Sensor Network, and Virtual concept based design, Clustering methods, Energy Efficient WSN, Structural optimization of WSN.

I. INTRODUCTION

The terminology "Virtualization of sensor network" (VSN) describes a novel methodology to study sensor networks for wireless communication (WCSN). Before continuing, it is helpful to establish certain essential words and discuss the similarities and differences between traditional WSNs,

traditional VSNs, overlay sensor networks, and VSNs. Simply said, in a traditional wireless sensor network, sensors are typically scattered along a dense network inside or close to the phenomenon of interest [1, 2]. When discussing virtualization, networks that aid virtualization, and wireless sensor networks

that use virtual concept based design techniques are all referred to as "virtual sensor networks" (VSN).

Traditional sensor networks consist of interconnected nodes that seamlessly collaborate to achieve a shared purpose [1], [2], [3]. When a subset of wide wireless sensor network is designated for a particular activity or to run a particular application, we refer to this subset as a wireless sensor network (WSN) [4], [5]. In contrast, a Virtual Sensor Network is comprised of several wireless sensor networks that are coordinated to carry out a single objective at a single point in time. A virtual sensor network is formed when many cooperating sensor nodes are linked together. Wireless sensor nodes may be organised into many types of virtual sensor networks, each tailored to a certain phenomenon. Setup, maintenance, usage, and adaptation of a virtual network by a hand-picked group of Wireless sensors working together on a job should all be possible thanks to the protocol in a virtual sensor network. Even non-sensing wireless nodes may be a part of the virtual sensor network if they enable sensing nodes to communicate.

This work mainly covers the following aspects related to virtual concept based designing of Wireless Communication Sensor Network. Initially, lifespan of basic WCSN design is considered and analyzed on the basis of allotted power backup's related issues and direct and shortest distance based routing. This analysis can provide aid like to choose power allocation methods, required packet rates, hop count to setup a basic wireless Communication Sensor Network with improved lifespan and better utilization of energy. The study and comparative analysis of basic WCSN can provide a better base for attaining the main purpose of the research. As a part of the study and our proposed work, the literature and research work of various authors, basic designs and algorithms discussed in details, these will provide a better base for attaining the main objective of the research work. In

this main objective is to find relevance of Virtual methods based design of WCSN for the functional enhancement so that it can support virtual Sensor Network in better sense. Here effect of virtual concepts like virtual channel, virtual cluster head, virtual cluster formation, virtual machine and virtual server based design model and structural optimization on Wireless Communication Sensor Network have been analyzed. A better understanding have accomplished through comparative analysis with and without virtual concept in each case.

The aim and objective of the proposed research paper can be summarized as,

- To enhance the utility of Wireless Communication Network using Virtualization of resources for making it more suitable to be an integral part of Virtual Sensor Network.
- To study Basic Wireless Communication Sensor Network and estimation of their performance.
- Simulation & Analysis of Basic Wireless Communication Sensor Network.
- Design strategies and simulation of Wireless Communication Sensor Network using Virtual methodologies.

II. MOTIVATION

Virtualization of networks has been increasingly significant in recent years, particularly in the field of network-based research. There has been a lot of interest from both business and research institutions in the idea of sensor virtualization [6],[7]. The phrase "virtualization on sensor networks" (VSN) refers to the practice of decoupling the duties of a Wireless Sensor Network (WSN) Service provider into two separate entities: the "Wireless Sensor Network Infrastructure Provider" (WSNIP), the in-charge of maintaining the physical hardware that makes up the WSN, and the "Virtualization Sensor Network Service

Provider," which generates the VSN by pooling the resources of many WSNPs and delivering the real VSN itself (ALU). Using a WSN architecture predicated on virtual concepts might greatly increase the possibilities of virtualization.

The realization that most sensor nodes in a WSN are predominantly idle is largely responsible for recent resurgence of interest in WSN virtualization. Virtualizing sensor networks is a great approach to make the most of each individual sensor node's capabilities. Wireless communication sensor networks can be virtualized to serve as a testing ground for new approaches to sensor network design [8]–[13]. Virtualization in WSNs is also anticipated to support new business models by enabling trade of Wireless Communication sensor network resources amid various application-level users [14]–[16]. Coexisting heterogeneous WSN Architectures, unconstrained by the constraints of existence multi-vendor sensor networks, can provide this sort of virtual sensor environment [17]. VSN is able to offer green and low-cost technological solutions for the planning and construction of high-tech dwellings and urban areas.

The virtualization of wireless Communication sensor networks has many potential uses, including but not limited to the following: agricultural monitoring; health; vehicle communication services; industrial monitoring; the battlefield; the monitoring animal crossings in mountain areas; the design and tracking of home automation. The above-mentioned use cases can benefit from VSN's cost-effective system design and enhanced WSN performance thanks to the concept's virtual concept-based design.

III. PROPOSED MODEL

Virtual Concept based layered architecture consists of all basic components of WCSN along with additional process and extra resources like virtual channel based

communication, Virtual Cluster Head beside Cluster Heads, Virtual Cluster formation, Virtual machine based base stations and Virtual Servers based Cloud.

When the Structural Optimization of Virtual concept based WCSN for critical event detection is initiated, then the optimized structure includes, that node which has detected the critical event first along with cluster head of same cluster and there will be formation of virtual cluster including other cluster heads present in the network. Structural optimization will further reduce the size of virtual cluster by selecting only those cluster heads which can satisfy the threshold condition based on utmost residual energy minimum congestion and minimum distance from the base station.

Virtual machine based base station and virtual servers-based cloud can play its role for transferring critical event.

Steps involved in the analysis of virtual concept based structural designing and structural optimization processes for Wireless Communication Sensor Network are as follows.

- Study and analysis of Basic Power management method.
- Cost estimation on the basis of distance base routing.
- Virtual channel concept-based design of Wireless Communication Sensor Network.
- Virtual cluster head-based design of Wireless Communication Sensor Network.
- Virtual cluster formation design of Wireless Communication Sensor Network.
- Optimization of Virtual cluster of Wireless Communication Sensor Network.
- Structure optimization of Wireless Communication Sensor Network.

- Cloud based Wireless communication Sensor Network structure.

“Multiple Random virtual cluster head formation (MRVCHF-WSN),” a novel clustering technique.

MRVCHF-WSN is inspired by virtual methods used in various computernetworks. Virtualization of resources is gaining much importance in the field of communication for better resource utilization. In MRVCHF-

WSN along with cluster head formation, a virtual cluster head (VCH) is also formed in a single round. Thus, the moment energy of primary cluster head goes below the residual energy of VCH then the responsibility of data transmission is transferred to VCH before the start of next round of cluster head selection. Thus by the use of MRVCHF-WSN lesser number of rounds will be required for cluster head selection which results in less energy consumption and improved lifespan of WSN.

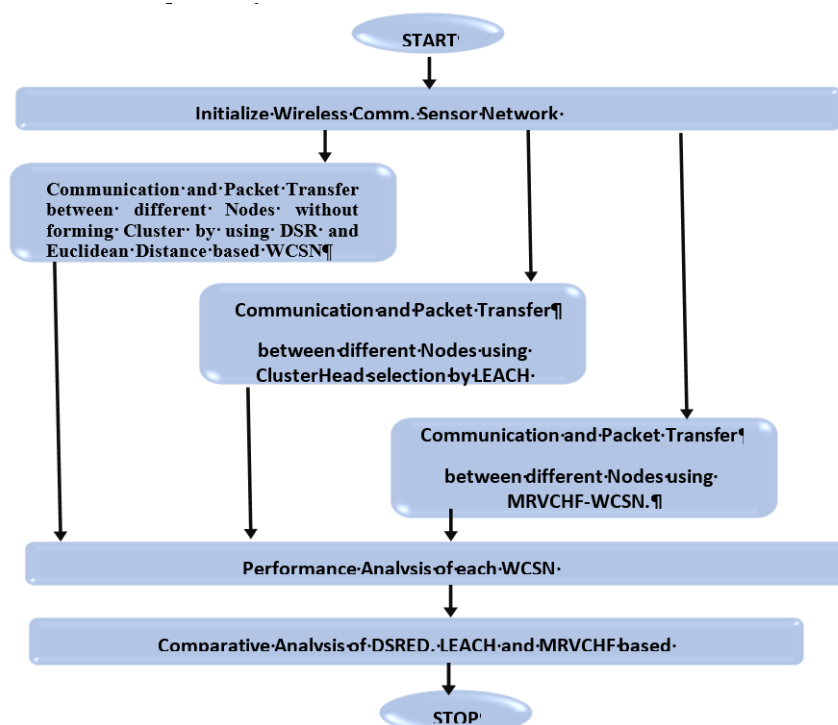


Figure 1: Programme Flow for Virtual Cluster Head (VCH) Base WCSN Structure Design

Comparison is carried out with & without VCH and simulation results shows that it has better performance than LEACH.

The flow for this Virtual Cluster Head based designing of WCSN is as given in Figure 1.

IV. Experimental Results

The results of the simulation show that there is a loss of data packets, an increase in energy consumption, a delay from

beginning to end, and an increase in throughput when 20, 30, or 40 nodes are assumed to be on a single virtual channel, multiple virtual channels, or a cluster virtual channel, respectively. The findings of the simulation demonstrate that there was a loss of data packets, energy consumption, end-to-end latency, and throughput.

Few samples of NS-2 simulation environment are considered in excel worksheet format and comparative results are plotted as below:



Figure 2: Time Vs Energy Consumption plot of LBRD-WSN and MRVCHF-WCSN in NS-2 Environment



Figure 3: Time Vs Delay plot of LBRD-WSN and MRVCHF-WCSN in NS-2 Environment



Figure 4: Time Vs Throughput plot of LBRD-WSN and MRVCHF-WCSN in NS-2 Environment

V. CONCLUSION

The nodes that make up the clusters are represented by the third layer in the Wireless Communication Sensor Network's tiered structure. Wireless clusters have a finite lifespan. The utilization of MRVCHF-WSN will reduce the number of needed cycles for cluster head selection, which will ultimately result in lower levels of energy consumption and an increased lifespan for WCSN.

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