



Green Telecommunication: Life Cycle Assessment of Energy Efficient Wireless BTS

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Abstract— *The green telecommunication is the branch of telecommunication based on the energy efficient mechanisms to reduce the power consumption on the network nodes, which finally impact the release of carbon dioxide in the environment. The carbon footprints are the term to find the release of the carbon in the environment. To keep the environment green and healthy, the carbon fuel usage reduction on the sources of electricity production like thermal units or similar other power generation sources is very important factor. The above target can be achieved only after lower the total power consumption. The networks with base stations are usually consisted of several nodes in the communication clusters. The power consumption of these nodes can be reduced by optimizing the packet size, data aggregation, optimized data forwarding techniques, etc. The energy efficient data aggregation on the base station and the packet data optimization on the other nodes is the major objective of this research. This research will lower the energy consumption of the entire network by using an effective data optimization algorithm on the source nodes. The proposal also includes the data aggregation in the manner to reduce the power consumption on the intermediate nodes between the BTS and the destination server. The performance evaluation would be done on the basis of residual energy, percentage of energy consumption, load, throughput, etc.*

Keywords— *Green telecommunication, data aggregation, packet data optimization, energy consumption, power consumption.*

I. INTRODUCTION

One thing that is inevitable is the change in the climate. It is observed and surveyed that average temperature of the earth has risen up considerably as compare to what it was at the earlier. The main reason that renders such increase in the temperature is the global warming which is the consequence of the various greenhouse gases that gets accumulated in the atmosphere. Among these gases, Carbon Dioxide (CO₂) is one of major pollutant that gets accumulated in abundance in the atmosphere due to the consequences of frequent energy consumption in the atmosphere. Various catastrophic events such as floods, ups and down in sea levels, typhoons tend to happen due to the Carbon Dioxide (CO₂) rendered greenhouse effect. Study reveals that there have been drastic rise in the emission of Carbon Dioxide (CO₂) by more than 73%. Nearly 160 countries had signed for the abdication of gaseous emission by 5% from the year of 1990 to 2012. Various strategies have been adopted to abdicate emission of gases and using them under control measures.

The challenge for the telecom service providers, telecom equipment manufacturers and the government is to pursue growth in telecom networks, while ensuring that the 2 percent of global emissions does not significantly increase over the coming years. It is surveyed that about 2% of the total greenhouse gas emissions is contributed by ICT industry. The significant factors that put a heavy demand of energy includes PCs and screens of monitors, various telecommunication towers those handle the energy for signal transmission.

One of the significant sectors that contribute in the greenhouse gas emission is the Telecom Network Operators. They contribute while the energy consumption takes place from these network providers. When it comes to the connection of people in the world with the use of telecommunication network, the requirement of electricity for the proper functioning of this network becomes a crucial concern. Although telecom is dependent on energy resources, energy from the fossil fuels is required to operate various network of telecom. In order to deal with the dual problematic factors; energy consumption and expenditure cost of fossil fuels that rises, it is essential to discover an appropriate option for the energy resources.

In the prospective of demand of the people for living environmental conditions that tends to increase day by day, is being pushed back with the contamination that is caused by the network operators those handle communication industry. Another effective approach that the current industries are incorporating in their corporate infrastructure is 'Going Green'. It is expected to decrease the burden of demanding stock of energy and would relieve the pressure on the operational cost that a network bears. Just to review a statistics, it is found that the nearly expense that a telecommunication company bears on the energy is 1% of the revenue that it stems. For large scale company this 1% comes out to be amount that is no less than in crores rupees.

CSR that stands for Corporate Social Responsibility makes these industrialists to ensure their effective contributions in decreasing the burden of the energy requirement on the corporate sector altogether. These large scale companies have come forward with greening approach of telecom to give a promising solution to deal with the energy crisis. The major concern that these telecom industries are trying to put in is the control on emission of carbon in the environment by the going for the eco-friendly energy resources that are renewable in nature. It helps in maintaining the greenery in the environment which tackles the carbon like pollutants in the air.

On the one side if ICT is blamed to be the one of the major responsible bodies for the energy crisis, it is also one among the best solution providing sector. It not only contributes in reducing various GHG emissions by using various media of multimedia communication, M2M communication etc. It is the significant fact that ICT industry just not help in reduction of energy consumption by effective means but also it brings economical advantage to industries.

II. LITERATURE SURVEY

Kumar, Amit et al. [1] has worked on LCA (Life Cycle Assessment) of Wireless BTS to abdicate the Footprints of Carbon. It has been found that in order to achieve the Carbon Credits, LCA really plays an important role. These Carbon Credits ensures the minimization of negative impacts on the atmospheric conditions. In the real terms, the monetization of emission reduction is being performed by the Carbon Credits that help the cause. The basic review study can be done in [2-8].

Rambabu A. Vatti et. al. [9] has worked on throughput Improvement of Randomly Deployed Wireless Personal Area Networks. In this paper, the authors have proposed a solution to solve the problem of packet loss due to over usage of the intermediate nodes. The authors have proposed a routing algorithm based on the remaining energy at the intermediate nodes. Remaining energy based adaptive multi-hop Algorithm (RAMA), which takes routing decisions based on the remaining energy at each of the neighboring nodes and adopts short distance multi hop communication to relay the data from source to sink node. Krishnan, S. S. et al. [10] has worked the factors that consumes energy and continuous emission of CO₂ by the Indian mobile telecom industry. This paper describes the corresponding contribution of different segments of mobile telecom industry to the energy consumption and the emission of CO₂ gases that it results. Furthermore it adds by giving a report of the impact of energy efficiency with respect to the 'business as usual' scenario for 2010–2020. Amanna, Ashwin et al.[11] has worked on green Communications. Wireless communication has dragged the attention of the developing world as it has overcome the typical raw material requirements of the wired communication. It has smoothed the feasibility to operate it in the physical terrain. There is always a demand of high data rate by the cellular handheld devices.

Charaan, R. M. et al. [12] has worked on effective analysis on r-leach protocol for wireless sensor networks. To extend the lifetime of WSN the LEACH protocol is implemented by forming clusters for routing in a large scale network. LEACH protocol utilizes the technique of selecting the cluster head through random rotations of a local cluster to distribute evenly the energy load among the wireless sensor network. In cluster communication distributed nodes transmit data packets to its cluster head through intermediate nodes.

III. PROBLEM FORMULATION

Green Telecommunication is the major factor in the telecom world in the current scenario. The carbon emission is rising every year, which is hurting the environmental structure by the release of the greenhouse gases and pollutant in the atmosphere which is rising the overall temperature around the world. This all leads towards the worst days ahead if not controlled at this stage. The major goal of the current pollution control policies is measured by carbon footprints.

In the existing scheme, the authors have used Life Cycle Assessment (LCA) scheme for assessment of the energy consumption in order to make it more energy efficient. The LCA process consists of two sub-processes: Life Cycle Inventory (LCI), which takes care of the energy consumption by the hardware and software mechanisms in the IT based devices, whereas the second process, Life Cycle Impact Assessment (LCIA), studies the points of energy consumption given in the first step in order to define the new strategy for energy efficient infrastructure. The carbon footprints have to be lowered in order to lower the content of pollutants. In the proposed model, we are going to work with the green telecommunications are in the Network Simulator – 2 (NS-2).

IV. PROPOSED WORK

The proposed work is based on controlling the energy efficiency of the wireless BTS by using a combination of data aggregation, transmission and overhead data exchange techniques. The proposed energy efficient wireless BTS will be simulated with a group of wireless nodes, where a number of experiments with the various data transmission, aggregation and other related techniques would be tested in order to create an energy efficient wireless BTS. The performance of the proposed model will be tested using various network parameters along with the energy model module of NS-2.

V. PROPOSED WORK

At first stage, an extensive survey is to be done on the green telecommunications and life cycle assessment methods or architectures. Flow chart for the methodology adopted is shown in the figure 1.

In addition, the energy consumption problems and requirement analysis of green telecommunications in wireless networks is planned to be explored thoroughly. An exploration of the review of literature comparative analysis will be done to propose the solution for the security aspects. Thereafter, the implementation will be done in NS-2 simulator and investigation of performance will be evaluated. Thereafter the results will be validated with the existing techniques.

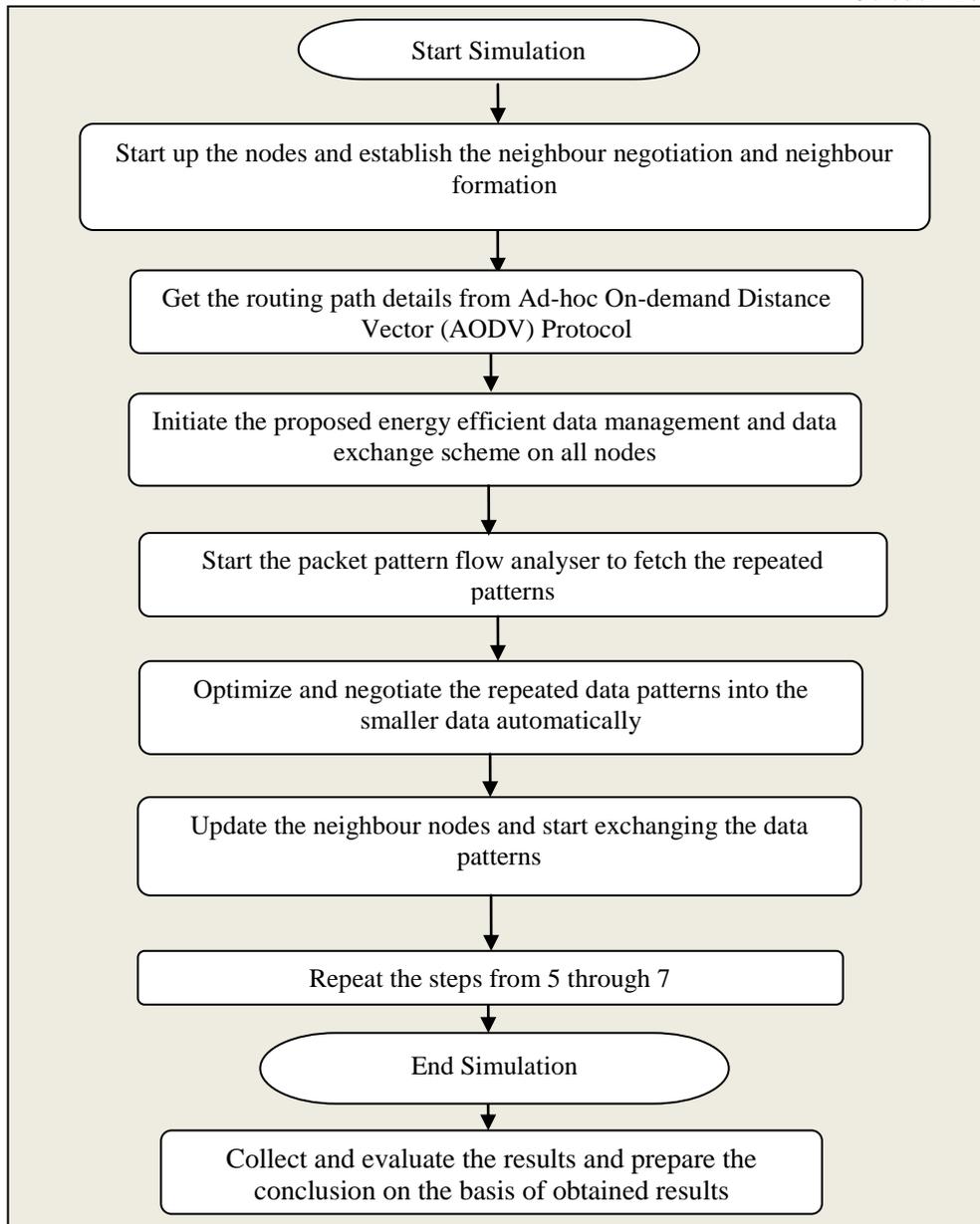


Figure1: Flow chart of the simulation work

VI. CONCLUSION

The proposed work will be implemented in the NS-2 simulator using a standard topology. The proposed work will be entirely based upon the design of the data aggregation and packet optimization algorithms. The combination of latter two techniques would be used to reduce the power consumption at the source and intermediate nodes. The performance of the proposed model will be evaluated on the basis of various network performance and energy based parameters. The proposed work will be also evaluated in the terms of carbon footprints and release of the carbon amount in the environment.

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