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GREEN COMMUNICATIONS AND WIRELESS NETWORKING

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Abstract

Technological advance has led us to countless environmental problems on a global level and higher energy consumption, and this research paper aims to bring to light the problems and certain concepts that theoretically/practically be potentially used to counter the issues brought about.

Keywords:-*Emissions, power consumption, telecommunications, ICT, efficiency, RAN*

"It has become appallingly obvious that our technology has exceeded our Humanity" - Albert Einstein

INTRODUCTION

Technology is the application of scientific knowledge to practical human lives or, to manipulate the human environment. In the long term, technological advancement is essential to economic growth and development, and as technology advances, the local and global economy can thrive faster.

Today, advances in various forms of technology have the potential to drive production and economic growth and create new and better jobs to replace old ones. Potential topics like Energy efficient device-to-device network, energy efficient ultra-sense networks, energy efficient spectrum efficiency, and many more are being discussed and looked into. Studies have shown that the number of mobile subscriptions around the world has increased exponentially from 500 million in 2000 to 5 billion in 2012. In short, the increase in network communication is on a fast track, and with it comes the increasing data and energy costs, high energy consumption, and many environmental problems. And that's where green communication came to fix the issues at hand.

Green communication is basically the application of the idea of choosing from different energy-efficient communications and communications technology and products, thereby reducing the usage of resources where possible in all communication branches. And while the introduction to green communications has produced substantial expectations, improving on the wireless networks is still an open research field and hasn't been perfected.

Yet, human-to-human or human-to-machine or machine-to-machine communications rely heavily on wireless communications and huge demands such as this can inevitably cause environmental issues on a global scale, making energy consumption a key issue. Thus, shifting to green communications is very essential.

According to the well-known Gartner report i.e., Gartner, 2007, the ICT market contributes to about 2% of global greenhouse gas emissions. A typical mobile phone network consumes about 40-50 MW and a service provider such as Vodafone uses more than 1 million gallons of diesel per day to power its networks. This means that wireless connectivity could create a weighty bulk of the total energy consumption of the ICT infrastructure. To save costs, two major issues need to be addressed in green communications:

1.Reduce energy consumption to reduce operating costs.

2.Creating a more friendly environment by reducing carbon emissions. Therefore, it is necessary to develop new and advanced algorithms to reduce the total energy required for the operation of wireless access networks.

When considering the environmentally friendly solution, air pollution, water pollution, and soil quality, ozone layer protection, natural resources, waste minimization, and many others have to be considered the main impact. Telecommunications equipment usually contains a large number of scarce materials and heavy metals. The biggest challenge is to extract these materials through mining and treatment of the waste, which is one of the main challenges to the environment.

To get a complete view of the environmental impact of a product, all five stages should be considered, particularly material extraction, production, use, transport, and end-of-life. The drag on the issue of energy consumption, which is important to the use of ICT in relation to carbon emissions should also be considered. While discussing the same, we should consider the emission of greenhouse gases such as methane, nitrous oxide, carbon dioxide, PFCs, HFCs and sulfur hexafluoride. These greenhouse gases have a different global warming potential (or GWP for short) considered for a hundred years horizon.

When analyzing the direct and indirect impacts, environmentally-friendly solutions should be considered. For example, implementing a solution that reduces the energy consumption of a service has a direct impact. Indirect impacts of solutions are related to the broader concepts of solution acceptance. The presence of email instead of letter writing, issues of transport, paper usage, etc. Indirect impact reduction often limits environmental issues. Since political, financial, and media differences depend on this, such reduction is very difficult to predict.

Experimental

Increasing efficiency is a key strategy in reducing environmental impacts. If we consider the adoption of email, one could state that by replacing every letter sent by email we are largely reducing the impact of those letters. This case shows that initiating the indirect environmental effects of solutions is a difficult task that must be done with great care. The structures of the carbon footprint of site manufacturing and construction for the radio access network (or RAN for short) are based on a comprehensive analysis of the Life cycle of network equipment. The total RAN electricity consumption in 2007 was almost 20kwh. Recent research

gives us an idea about the construction of new sites and the removal of old site equipment. From the survey by Vinay M and Rudresh Y R, in their paper "A Review on Green Communications" in 2018, it is known that on average there is a 10 percent decrease in the new base station when compared to the previous year.

Energy efficiency metrics provide information that can be used to evaluate and compare the power consumption of different parts of a mobile network and of the network as a whole. These metrics also help us to set long-term research goals to reduce energy consumption. With the proliferation of research activities related to green communication and due to internal differences and the importance of different communication systems and operational measures, it is difficult for one metric to suffice. While the definitions of energy metrics for buildings and equipment levels are straightforward, it is very difficult to define energy performance metrics at a system or network level. Network level metrics evaluate energy efficiency at the network level by bearing in mind the features and properties of the coverage and capacity of the network. Here are goals that are connected with green cellular network:

- ✓ Improvement of energy efficiency.
- ✓ Improvement of the intelligence of the network through tradeoffs between energy consumption and external conditions, that is, traffic loads.
- ✓ Integration of the network infrastructure and network services to enable the network to be more responsive and to require less power to operate.
- ✓ Reduced carbon emissions.

RESULT

Currently, LTE marketing solutions are not available for all architecture/BS. Therefore, provided power models are usually found in existing solutions and may diverge each other's. The relay case is symbolic in this sense: these low power nodes are categorized by a reduced area covered than the macrocells, so they can significantly decrease the irradiated power relative to M-BS. In addition, they are expected to have simpler structures than M-BS which has consequences, resulting in lower aggregate power consumption.

DISCUSSION

It is also important to deal with the appropriate components of wireless structures that may affect the power consumption greatly. According to Figure 1 below, the power consumed by the retail group, data centers, core transmission, mobile switches, and BS is about 2%, 8%, 15%, 20%, and 55%, respectively.

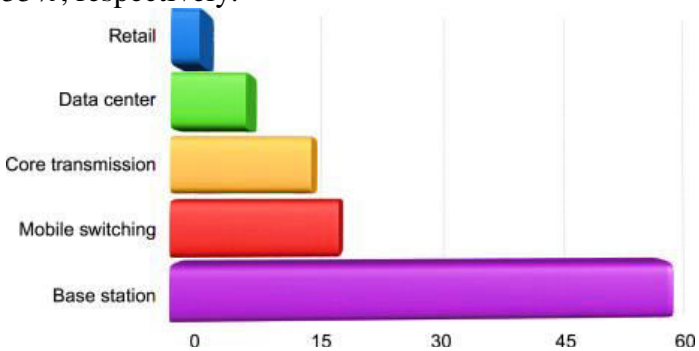

Fig.1 Percentage of power consumption in the cellular network infrastructure.

This suggests that BS or access point could be an important part of future research. Increased power consumption on wireless networks results in greenhouse gas emissions which can be considered a major threat to environmental protection and sustainable development.

In fact, before the green radio program, there have been efforts to progress energy savings in wireless networks. Ways such as developing additional efficient power amplifiers, implementing passive cooling, and minimizing the feeder losses. However, these efforts were not sufficient to achieve the goal of saving energy within 5 to 10 years. On the other hand, the GR program with innovative solutions, based on high-quality architecture and integrated construction at all levels of the system and protocols, can certainly bring more results soon.

CONCLUSION

Green communications research focuses a lot on reducing the energy usage from a system perspective, often disregarding the effect on RF radiated power. However, some green solutions may reduce a few APs to operate with greater radiated power. Recently, public concern has arisen over the potential impact of electromagnetic fields on human health, and the mobile community should improve the adoption of existing wireless systems by reducing human exposure without compromising QoS. Therefore, it is necessary to understand the trade between fundamental green enablers and EMFs and to investigate joint ventures that reduce energy consumption and exposure to electromagnetic radiations.

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REFERENCES

1. Britannica (https://www.britannica.com)
2. Brookings (https://www.brookings.edu)
3. Hardee Business (https://hardeebusiness.com)
4. Science Direct (https://www.sciencedirect.com)
5. Journal of Communications Vol. 15, No. 3, March 2020 (https://www.researchgate.net/publication/339310550_Green_Communication_Networks_Challenges_Opportunities_and_Future_Role)
6. International Journal of Engineering Research & Technology [IJERT] (ijert.org)