



ROOTING GREEN ROUTES

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Abstract

Though the burning woods and coals; boiling water can provide us energy now, these will not be enough then. Today, the requirement of energy has increased and it will continue to increase until we all realize that we are left with no resources to produce energy. So, in order to prevent the extinction of the resources, the scientists and other researchers are pressing to shift to renewable sources of energy. This in turn will benefit us: we can save the non-renewable sources of energy and reduce the global warming, hence saving our Mother Earth.

Communication sector, now being the most important sector, consumes 1 million gallons of diesel per day to power up the whole network and uses^[8] 2% of the global energy, which is expected to rise by 6% in the near future. Also, a mobile phone network uses 40 – 50 Mega Watt of power per day. The internet or communication sector releases about 4% of carbon dioxide into the environment which, is more than that released by the aviation sector.^[8]

Keywords: *Green network, Li Fi, advancement in technology, smart topology*

Introduction:

Green communication aims for sustainability with the minimum utilization of energy so that it cuts down the carbon dioxide emissions and the operational costs. It is an innovative way where it uses algorithms which helps in reducing the energy required for operating the wireless networks. Green communication could be incorporated with the renewable sources of energy like solar, wind, etc. which again will help to reduce the carbon dioxide emissions and the costs in the long run. There are a few categories that the network topologies today could work on: the engineering, adaptation of the smart devices.

Categories:

- **Re-engineering:** new energy efficient hardware devices.
- **Dynamic adaptation:** intelligent modulation and rating modulating the capacities of packet processing systems and of the network interfaces.
- **Sleeping/ stand-by:** intelligent networks by introducing smart devices and software.



Techniques:

Green network is what the world is now aiming for. So, there are a number of techniques where the existing networks can be converted to green ones:

Utilization of:

- **Power amplifiers(adoptive link rates)** can help to boost the signals sent instead of resending it again and again reducing the traffic in the network, hence the energy required.
- **The renewable sources of energy**: can reduce the cost of buying non-renewable sources of energy and also will cut down the CO₂ emissions.
- **Smart topology (energy aware infrastructure)** like making a compact structure of the complete network, agile bases, femto cells (low power cells).
- Operations like: **set level turn off (interface proxing)** (will turn off the system and divert signals when there are less data packets sent or received), **cognitive radio**(it checks for the active route and also changes the route to the empty line when there is a lot of traffic in one line), **OFDMA**: orthogonal frequency – division multiple access (it solves the congestion problems caused by simultaneous access by multiple users by accommodating multiple users at same time by giving each user better internet access, **smart grid**(helps in the efficient, two-way flow transfer and restoration of electricity).
- **Energy aware application**: instead of making the hardware energy efficient, it is software that we make more energy efficient.

All these techniques when combined can help reduce the overall requirement of energy and cost as well.

Advancement in network technology

As the technology is getting enhanced faster than anything, so is the technology of the network. It started from 2G and is still increasing 3G, 4G and now 5G. So, the technology at each transition of network is more energy efficient, eco-friendly and cost effective. The 5G network can be greener than the 4G network because of its network topology. The wavelength of the frequencies used in 5G are millimeter waves (28 GHz and 39GHz) which, though can be absorbed by the trees and buildings (opaque objects), provides a better internet speed. 5G networks use beamforming where the focused stream of data is sent to a specific user so that the capacity of the outgoing data and incoming signals can be increased and uses the full duplex way of transmission. There are also efforts made to increase the capacity of the nodes by adding multiple input and output devices. The clustering of the sensors, small cells (low power cells which can help to get the signals around an opaque object) and cluster heads can also help to provide an energy efficient mechanism to the network.



Li Fi (light fidelity) Technology

Internet is the most important thing to survive after Food, Water, Shelter and Clothes. So, in order to make internet available easily and in a cheaper way Prof. Harald Hass introduced Li Fi on TED, on July 2011. Li Fi is a technology that can transfer data packets using the visible, artificial lights: light communication. So, basically, the light sources in Li Fi continuously flickers (this flickering of light is so fast (>million times per second) that is in not visible to our naked eyes), which later forms the algorithms of 0s and 1s to transmit data. Moreover, we can both download and upload data through this flickering.

Li Fi, though requires a special type of light technology, it can be used as a normal visible light and hence it saves the energy and power cost of putting an extra light source. Also, as Li Fi is a normal LED lights it can last for a longer time, moreover, it would not be harmful for the environment and the technology relatively consumes less energy as compared to the traditional Wi Fi systems. Also, as the Li Fi is mainly built indoors it is more secure. The overhead network in the houses and offices; the smart signal conditioning, provide a better internet speed which reaches approximately 100 GPs. Although, the speed and security of Li Fi is really good, it is only good for a short range.

But, if the Li Fi technology is implemented in all the closed areas, then it could be a potential way of saving a lot of energy. Though, it may be a little costly initially, but it could save costs of energy and pollution caused.

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