GREEN WIRELESS COMMUNICATION

THOBIAS CHRISTOPHER (HD/UDOM/188/T.2014)
LECTURER: ANTONY FAUSTINE

THE UNIVERSITY OF DODOMA

October 13, 2015

PRESENTATION OUTLINES

- Introduction on Green Wireless Communication
- Definition of green wireless communication
- Classification of Green Wireless Communication
- Relationship between ICT and GHG as well as energy
- Conclusion

INTRODUCTION ON GREEN WIRELESS COMMUNICATION

Recently, it has been shown that the accumulation of greenhouse gases in the atmosphere is growing more rapidly than initially predicted. This understanding has led to a push towards "green" wireless communications that strives for improving energy efficiency as well as reducing environmental impact. Reduction of the green house gases produced or caused by the telecommunication sector is referred to as greening of telecommunication.

Definition of green wireless communication

The term Green Wireless Communication can be defined as the technology which uses energy efficient methodologies at different stages to minimize effects of technology on environment.

The reason for increased GHG, mainly Carbon Dioxide, is because of the increased energy consumption which results in formation of pollutants.
It is stated that, ICT industry alone accounts for about 2 percent or 860 million tones of the world's greenhouse gas emissions

CLASIFICATION OF GREEN TELECOMMUINICATION

It can be classified broadly in terms of;

- greening of telecommunication networks,
- green telecommunication equipment manufacture,
- atmosphere friendly design of telecommunication buildings
- safe telecommunication waste disposal.

Green wireless communication technologies:

- Green handover,
- Green charger
- Smart Grid,
- Green electronics,
- Green power amplification systems,
- Green antennas and
- Green base transceiver
- stations using renewable energy sources.

Green handover

Green handover mechanism for cellular networks aims at reduced emission from mobile phones.

Green handover

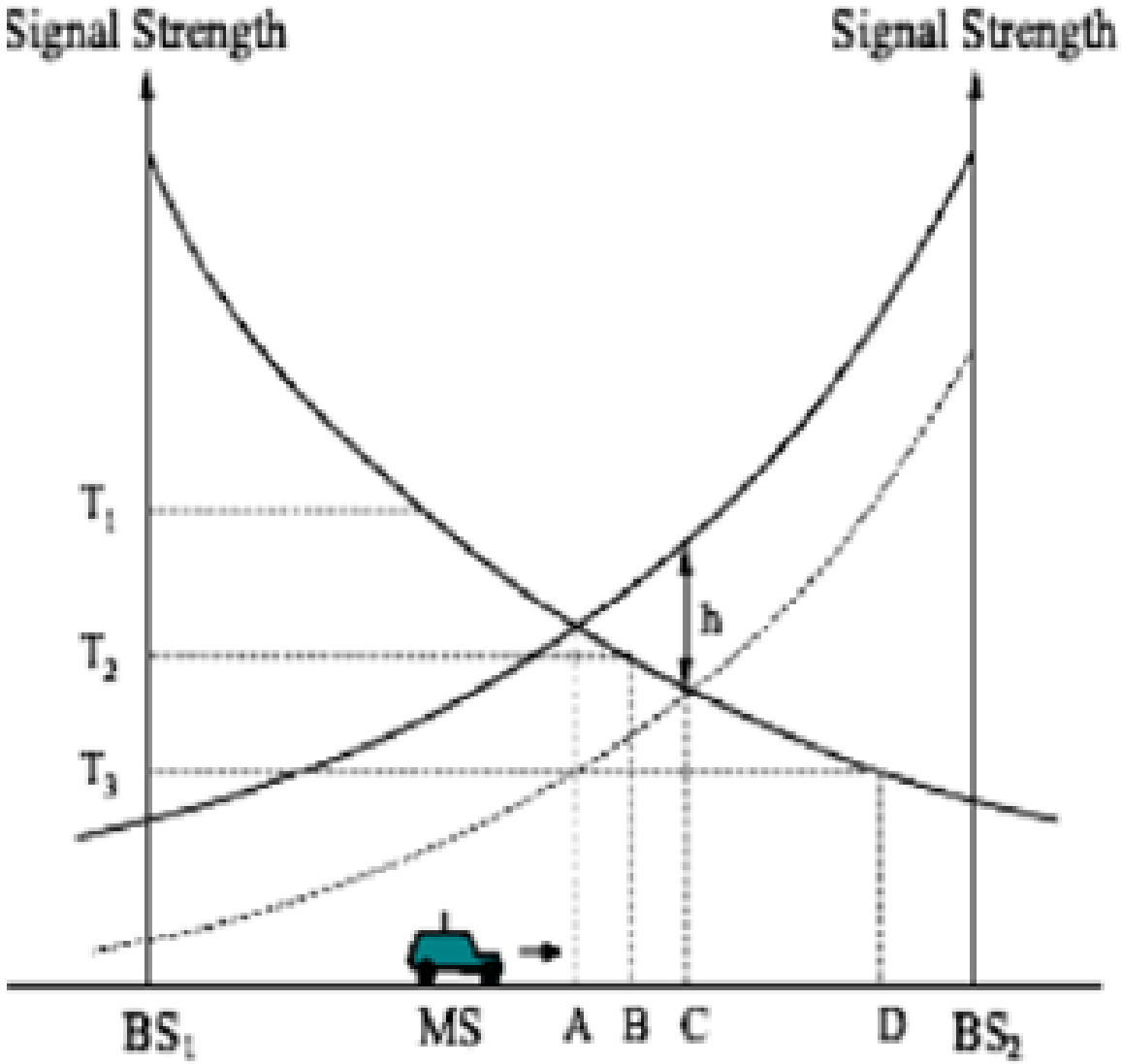


Figure: signal strength and hysteresis between two adjacent BSs for potential handoff

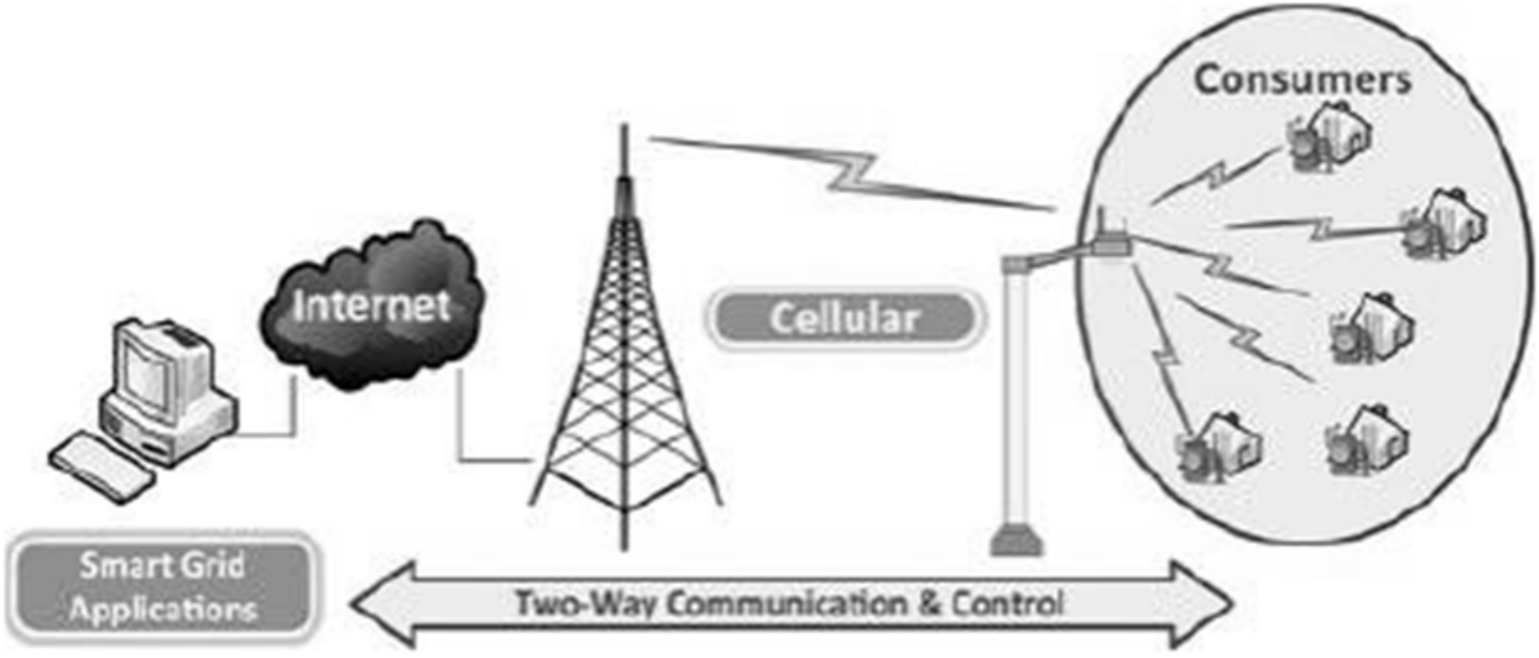
Green charger

A green charger using solar cells for instance using solar cells and the diode which prevents battery from discharging through the cells at night and the cells boosts the voltage up enough to compensate for the voltage drop across the diode

Smart Grid

The term "Smart Grid" refers to a transformation of the electricity delivery system so that it monitors, protects and automatically optimizes the operation of its interconnected elements. It includes adding two-way digital communication technology to devices associated with the grid. Each device on the network can be given sensors to gather data (power meters, voltage sensors, fault detectors, etc.)

Smart grid


Consumers
Internet
Cellular
Smart Grid Applications
Two-Way Communication & Control

Green antennas and green electronics

Solar power is the primary source for renewable energy. Over the past decade, some works have been reported on integrating the antenna with solar cells light reflecting green antenna for the solar cell should be designed. Lead free electronics should be developed to promote the idea of green wireless communication.

Mechanisms for improving energy efficiency

- Frame
- Super-frame
- Flow
- Usage pattern

Frame

The mechanisms in this category operate on a per frame basis, i.e., they update the corresponding variables right before the actual transmission of a frame, based on the observed network conditions. Typical variables include, e.g., transmission power, modulation coding scheme, or frame length.

Super-frame

Here we consider the mechanisms that regulate the protocol behavior between several transmissions. Precisely, here we consider all MAC-related mechanisms, this including both adapting the MAC parameters (e.g., scheduler, contention variables) and configuring the power saving schedule of the wireless interface.

Flow

This category includes the mechanisms that adapt to the load in the network, and correspondingly tune the configuration of the resources available to best serve the traffic. This typically involves algorithms that are executed across various hops (e.g., adaptive routing) or the use of inter-technology cooperation (e.g., relay traffic using the WiFi interface).

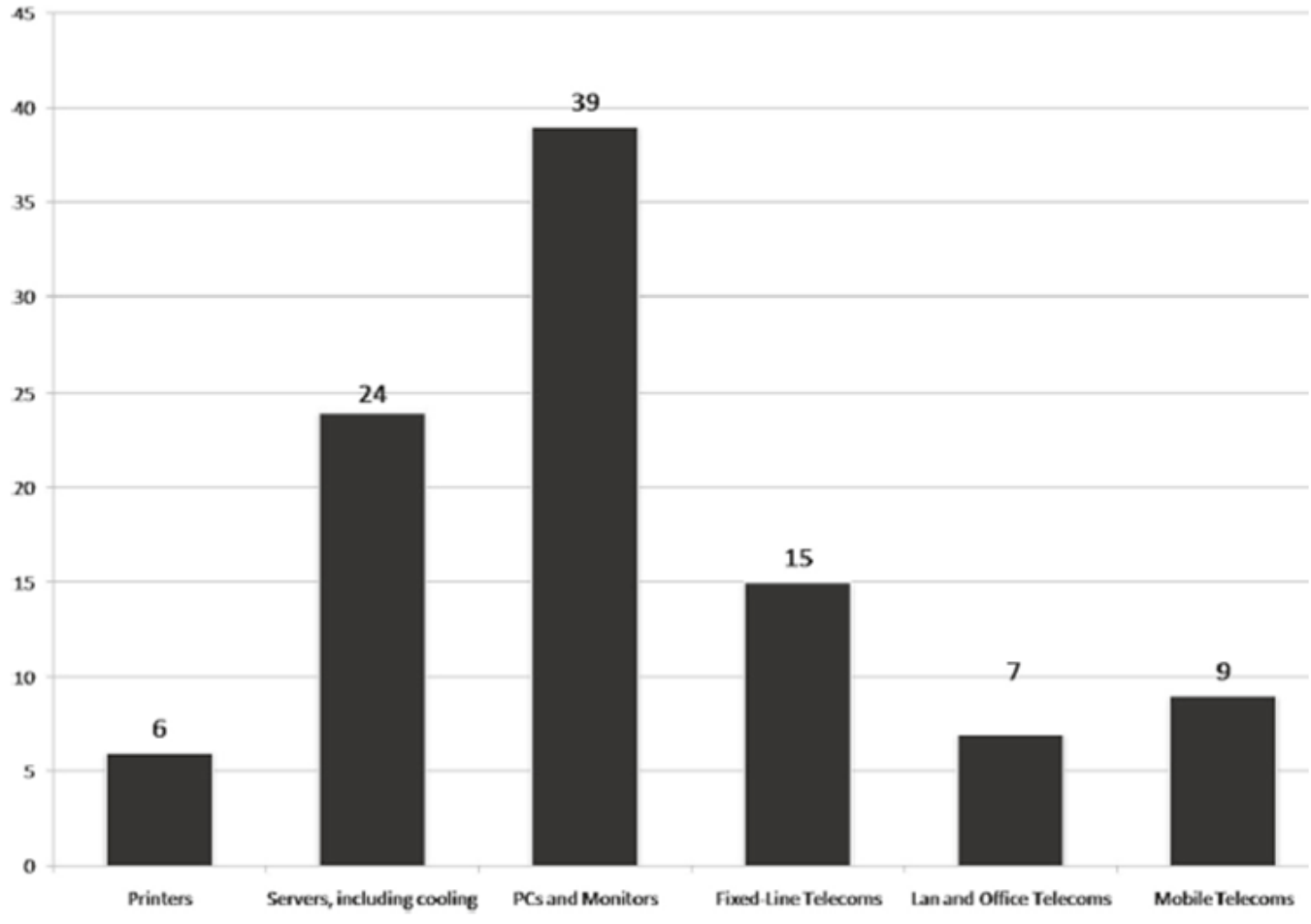
Usage pattern

In this category those mechanisms whose aim is to dynamically configure the network deployment, taking advantage of the large variations of the user arrival rate with respect to time of day (e.g. office vs non-office hours).

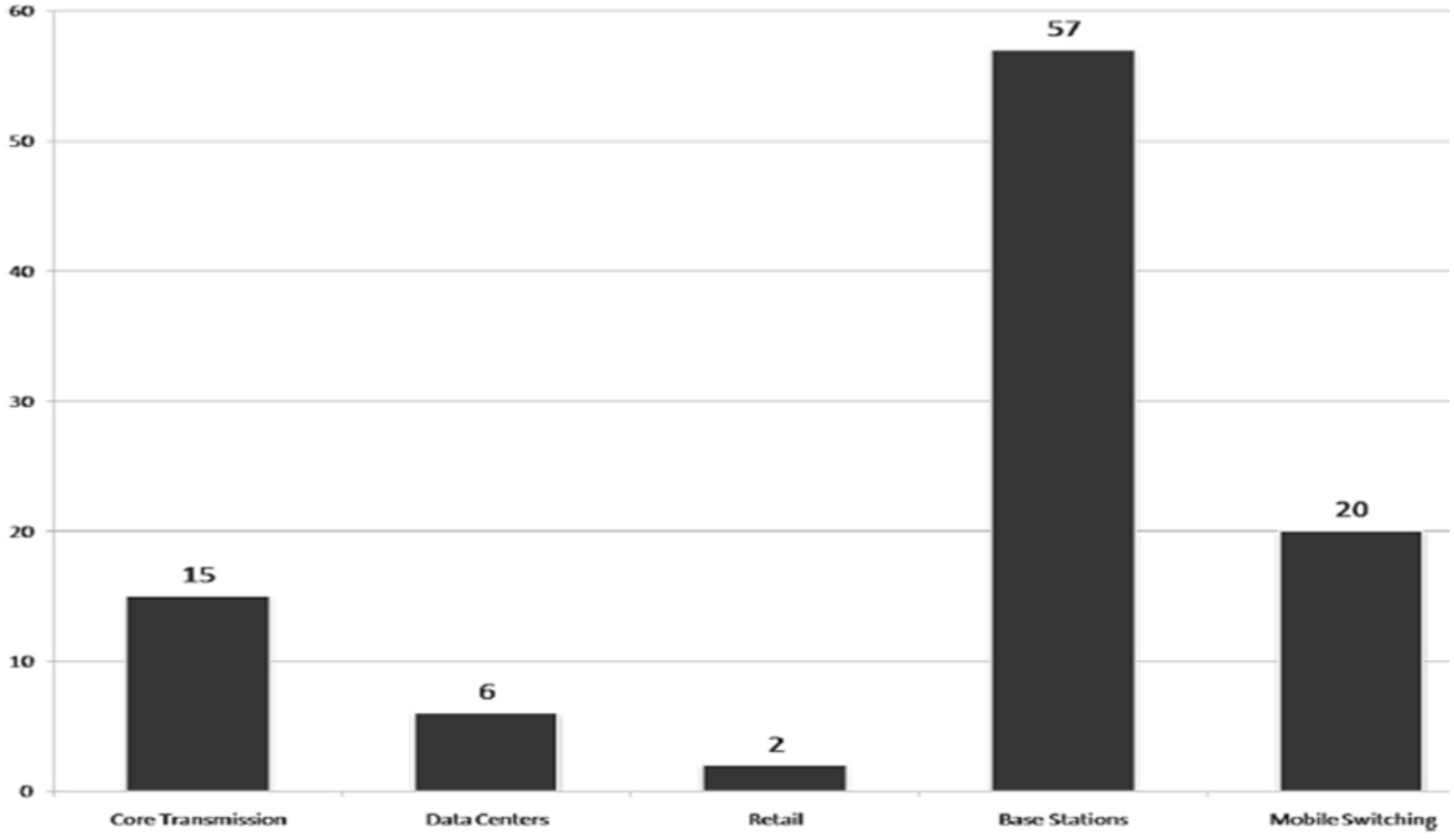
Relationship between ICT and GHG as well as energy

ICT has got strong contribution to the current life of human in all sectors of life however according to the researches it has been revealed that it has also considerable contribution in both GHG production as well as high consumption of electrical power and hence the a lot of mental energy and economical energies are required in order to bring down these high consumptions.

ICT fields' global Carbon Dioxide emissions in percentage



Cellular Network Power Consumption in Percentages



Open challenges and future directions

- Standardizing benchmarks to provide an homogeneous performance evaluation framework.
- Studying ways to gain the most out of the combination of different green networking proposals.
- Employing novel agile radios to efficiently use the spectrum.
- Experimentation in wireless metropolitan area networks (WMANs).
- Providing low-cost platforms to enable the diffusion of academic experimentation in the WMAN field.
- Designing low consumption networks and protocols, which permit the utilization of off-the-grid renewable sources of

Conclusion

It is predicted that the growth rate of the ICT industry is going to continue with the invention and widespread usage of new technologies such as IoT (Internet of Things), Cloud Computing, Smart Cities, and Smart Homes. Thus, it is extremely important to develop energy efficient protocols which can satisfy the growing demand with similar or better performance levels both for economical and environmental reasons.