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Energy Efficient Model for Wireless Communication :A Survey

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ABSTRACT
This paper presents a survey of power consumption and technique power saving in the wireless communication at the base station transceiver. As power consumption is becoming a key is suein cellular network and base transceiver station is the heart of cellular network. The less expensive and effectiveness of the network operators, energy consumption in the infrastructure of cellular networks has become a trendy research topic in recent days. The cellular technology has been raised the energy consumption in mobile networks and carbon footprint in global warming. The increasing global warming will effect on the environment as well as human health. Addressing the suspects, this paper presents a survey on techniques for making the Energy efficient model for wireless communication.
Keywords: Base transceiver station, cellular network, energy saving, energy consumption and power saving.

I. INTRODUCTION

Now a day mobile communication is greatest growing in the world and the number of subscriber in cellular net work is 12 billion approximately. In upcoming year the number of subscriber and demand of availability cellular network is increases rapidly which lead to increase power consumption in network. The increasing in CO_2 is major issue of the Information and Communications Technology (ICT).

The researchers and practitioners have been seeking ways to reduce energy consumption. Cellular networks has significant component of ICT. Energy utilization has drawn attention of many researchers from both academy and industry. It is now widely recognize that cellular communication networks will have greater economic and economical impact in upcoming years. This issue has been recognized as a matter for both the planet and the wallet. Seeing this, an innovative new research discipline called green cellular net-works, concentrating on environmental influences of cellular networks, has been formed and attracted many researchers. The term green is originally a nickname of dedicated efforts to reducing unnecessary
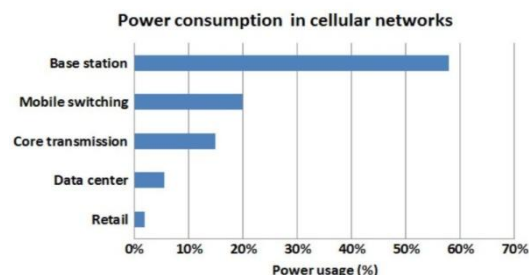

Figure1. Power Consumption in typical Wireless Network.[1]

Green house gases (e.g.CO_2) emissions from industries. For mobile operators in particular, another motivation and objective of green approaches is to gain extra commercial benefits , mainly by reducing operating the expense related to the energy cost. There are various methods to reduce energy utilization in a mobile cellular network. The previous research can be mostly classified into the following five categories.

- Improving energy efficiency of components.
- Turning off components selectively.
- Optimizing energy efficiency of radio transmission.
- Planning and deploying of the heterogeneous cells.
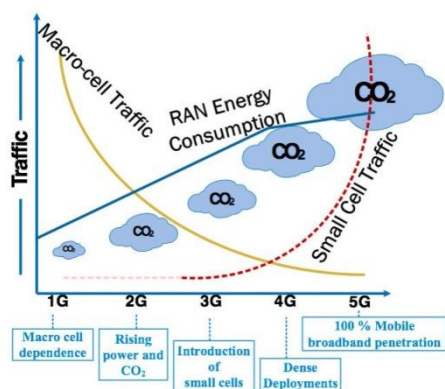- Green renewable energy resources for communication

Figure2. Trends in traffic, Energy Consumption & Co2 Emission.
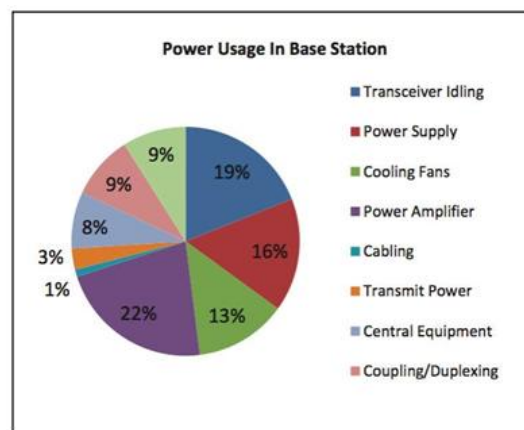[Source-Google Images]

A. Power consumption in cellular network

The cellular network consist different area of works and this required different amount of power in working. Figure.1 shows how many power consumption in different part of cellular network. Base transceiver station power consumption is 59% of total power consumption. Therefore it is state that base station consumes highest power consumption in cellular network.[2]

B. Base station (BS/BTS)

Mobile Switching center consumes 20% of total power, for data transmission it required 18% of total power, at data center it required 5% of total power and at retailit consume 2% of total power[3]. A Base transceiver station(BTS) is a one type of system that start wireless communication in between user Equipment(UE) and Network. There are three types of base station are macro cell, micro cell and femto/pico cell base station.[4] Each base station components required different amount of power for its preceding in formation according signal flow in base station and signal flow of base station power is shown in figure.3.The power amplifier consumes more power as compare to others. Transceiver idling and power supply component to bases station are consume nearly 19% and 16% of total power respectively.[5] There are so many basic components in base station and its consuming power according to the requirement. The power requirement of each component in base station is shown in figure which shows how much power will be consume by it out of total power required for base transceiver station.

Figure3. Power consumption in Base Station.[3]

II. POWER SAVING MECHANISM

A. Energy saving strategy

Energy saving strategy is depending on following factor:-
- The overall power emitted at the PA.
- If the BS is in the sleep mode or DTX mode, it required less power than in the working state with zero transmission power.
- If the same BS is operated with fewer Rf chains.

To attenuate this factor we use three energy saving strategy which are power controller, antenna adaptation and discrete transmission. Power controller strategy is use to reduced Transmission power which required for power amplifier. The overall power emitted by power amplifier is also attenuated by using sleep mode strategy. Antenna adaption is use to reduce the number of Rf chain required for signal transmission in base station. Discrete transmission strategy is increase time duration for signal transmission and sleep mode is also required discrete transmission for signal transmission.

B. Energy saving algorithm

Energy saving algorithm is work on how to signal processes form base station to mobile station. It deals with requirement of energy or power in signal processing. It is more useful to minimize power consumption in base transceiver system. Energy saving algorithm are RAPS algorithm, water filling algorithm, reverse water filling algorithm, greedy algorithm etc. The Resource allocation in Antenna variation, Power control and Sleep mode (RAPS) algorithm. It consists of mainly two steps:
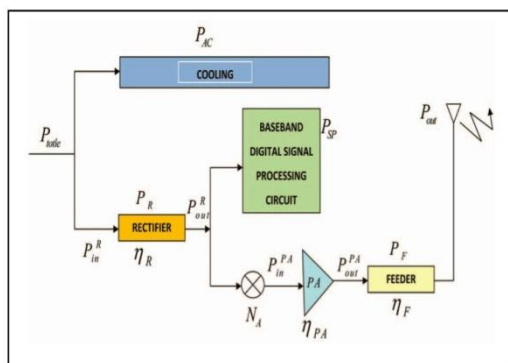
Figure4. Base transceiver station model systems.[2]

1) Antenna Adaptation, DTX and Resource Allocation.
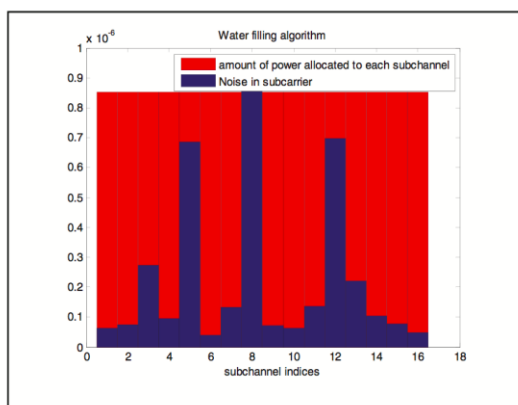2) Sub carrier and Power Allocation.

Figure5. Water filling Algorithm

Water filling algorithm has been used for optimizing power consumption in each sub channel of the wireless network. It is just like water finds its level even when there is single port to fill and it has multiple opening. It is use to prevent nonlinearity of power amplifier, power requirement and crosstalk in communication.

III. FUTURE RESEARCH DIRECTIONS

The energy consumption problem remains crucial and energy efficiency in cellular networks has to be significantly improved. Therefore, fundamental research for green wireless communications must be done. In our analysis, we focused on achieving energy savings through net work planning by switching off BSs during periods with low activity. However, more aspects should be considered and studied to wards this direction. Energy efficient solutions were presented for deactivating there redundant BSs during low traffic periods. The coverage gap of the switched off BSs was covered by their mining active BSs that increased their transmission power. Still the detail soft he switching off schemes to be examined, because there might be cases where the deactivation of BSs leads to coverage holes. For example, in high traffic regions, a switching off policy may lead users to outage due to lack of network resources.

IV. CONCLUSION

Energy Efficient network is the rising concern of the mobile network operator. The maximum energy of the power supply is consumed by the Base Station. There are different type of power saving Strategy. We use the water filling algorithms is in energy efficient model for wireless communication reduce the total power consumption at the Base Station. The water filling algorithms is use to reduce Base Station power consumption.

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