*International Journal For Technological Research In Engineering*
*Volume 4, Issue 12, August-2017* *ISSN (Online): 2347 - 4718*

# ANALYSIS OF POWER OPTIMIZATION TECHNIQUE IN THE 3G HANDSET-A COMPREHENSIVE SURVEY

Deepa B[1], Chethankumar K[2], Thyagaraja Murthy A[3]
[1,2]PG. Scholar, [3]Assistant Professor,
Dept. of ECE, SJCE College of, Engineering, Mysuru

***Abstract: In the cellular communication, battery life becomes the crucial part of the smart phones. As the smart phones are mainly used for voice services and web surfing purpose, the power utilized in these scenario is very high as it requires the transmitter and the receiver's to be turned ON and OFF. This paper gives a survey on the power optimization techniques in the smart phone. A simple methodology is explained where AMR voice data is mapped to three different channels according to the voice class, depending on the importance of the bits the data is divided into corresponding classes and correspondingly different coding and different length of CRC is attached to the respective class.This paper gives a overall survey of power consumption of thehand set in GSM and UMTSSubsystem***
***Keywords: mobile phones, power optimization, voice call, generation.***

## I. INTRODUCTION

Now a day's smartphones that uphold more communication protocols have become very handy, slim and light in weight compared to old phones which were bulky and heavier. Since the size and capacity of any battery which powers such small devices is limited, the power consumption becomes a very important criterion for all mobile manufacturers. Modem is the main hardware component in any smartphone which generally needs more power for its continuous operation. More the data rate, more will be the power consumption. Many ideas and techniques are being proposed across the world for the reduction of power consumption in smartphones. This paper proposes one such power optimization technique (Power Save Feature) implemented for 3G communication standard (also known as UMTS) and the power consumption. There are various feature developed to save power during 3G voice call (AMR-Adaptive Multi Rate voice service). The idea here is to use the smartphone hardware components efficiently during voice call there by yielding lower power consumption yet not compromising with any degradation in performance or data transmission or reception. This paper gives a general overview survey of the power consumption in smartphone ha and how it can be optimized. Though this survey paper is for3G and 2G communication standard, it is also applicable for next generation digital communication standards like 4G and 5G.

## II. METHODOLGY

Adaptive Multi Rate (AMR) is a technique used for coding and decoding of dynamic rate speech services in UMTS. The bit rate can be altered by the radio network during the service session, hence the name Adaptive Multi Rate. There are two standard AMR codecs included in the 3GPP specification – narrowband AMR and wideband AMR. The main difference is that the wideband AMR coder offers higher voice quality by means of an increased sample rate (16 kHz for wideband compared to 8 kHz when using narrowband). Nine data rates between 6.60 kbps and 23.85 kbps are available in the wideband AMR standard. The narrowband AMR codec offers 8 data rates between 4.75 kbps and 12.2 kbps .The radio access network can adaptively control the bit rate and for the narrowband AMR service the bit rate can be changed for each TTI.When the AMR encoder encodes data, the bits are arranged in different classes according to how important they are for speech quality. The encoded bits are categorized into three classes - A, B and C - where class-A bits are the most important bits and class-C bits the least important. For class A powerful coding and CRC are attached separately while less important bits are transmitted with mild coding, & there no need of CRC attachments. Figure 1 illustrates the mapping of one 20ms TTI to physical channel. AMR voice data is mapped to three different transport channels (DCH) according to the voice class (A, B and C). In downlink, one more additional transport channel is used which carries signaling information from the network called Signaling Radio Bearer (SRB). All these four channels are multiplexed to form one downlink physical channel (DPDCH) with 20 ms TTI for AMR data and 40 ms TTI for SRB data. This comprises of downlink data to the UE. The RAKE receiver, is a special receiver designed for the best radio reception in UMTS networkThe receiver unit contains the receiver hardware (RF) and the control software.

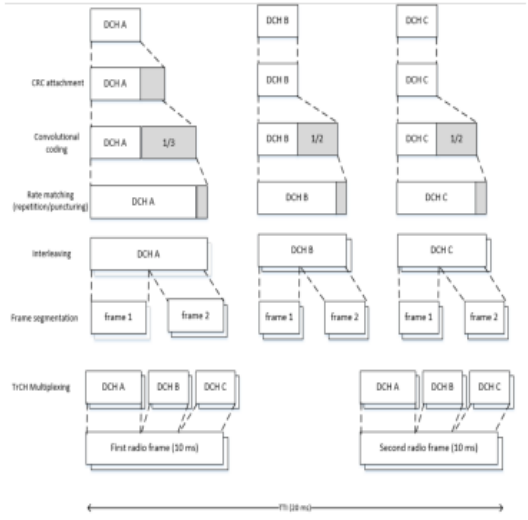


Fig 1: UMTS Dedicated Channel (DCH) mapping in AMR processing

  

The AMR/SRB data will be extracted from the received DPDCH and given to the speech pause detection unit. This unit determines whether the AMR TTI contains DTX (Discontinuous Transmission) or not and reports the same to the decision making unit. The decision making unit decides based on radio conditions whether to optimize the receiver baseband for downlink reception. This means that the components in receiver path could be commanded to operate with very low power or even could be turned off completely. The power save feature will be turned on only when the radio conditions are good and no other service is running simultaneously along with voice call. So it is obvious to detect such favorable condition in order to run the power save feature. The power optimazation in 3G call detects the pause in the in the speech , when there is pause in the speech receiver unit can be turned OFF as shomn in figure 2.

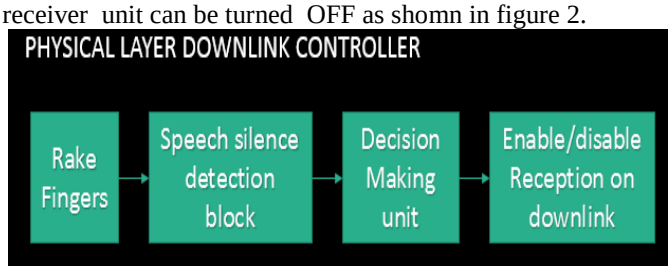


Figure 2: Overview of the power saving feature

Power Save Feature is enabled only for 3G AMR voice calls.

- The AMR voice call setup is running to turn on the Power Save Feature. Only after ensuring the AMR voice call setup the second step will be executed otherwise, step-1 will be executed from next frame.
- This can be accomplished by checking various parameters during setup or transport channel reconfiguration of radio links, for example: Number of transport channels, coding type, transmission time interval (TTI) length of each transport channels, transport formats etc.
- In the same manner, radio link parameters for AMR calls can also be well distinguished, such as the number of Transport channels for AMR setup which is 4.
- The code rate of transport channels for AMR is computed and guaranteed that it isunderneath characterized limit for reliable transfer of data. In case code rate is notsatisfied, feature cannot be enabled. Once AMR call setup is detected, the feature needs to be turned on only after a fixed delay to consider reliable Downlink Power controlSignal to Interference plus Noise ratio (DLPC SINR).

## III. LITERATURE SURVEY

This section discusses the articles and papers published on power consumption analysis and various possible techniques to reduce battery power consumption in smartphones. It is important to first understand where and how the energy is used in a smartphone. An analysis of power consumption in a smartphone under various usage scenarios is well explained in [1]. The authors have used a smartphone to conduct the test for all possible use cases. The main components analyzed in this study for power consumption are Application processor, Modem (GSM in this study), Bluetooth, WiFi, GPS, LCD, Graphics and memory units.

The important observations are -

- When the device is in suspended state i.e., the application processor is idle, while the communication processor performs a low level of activity in order to maintainconnection with the network to be able to receive calls, SMS messages, etc., the GSMsubsystem was observed to consume 45% of the overall power consumed by allcomponents.
- When the device is in idle state i.e., the application processor is fully awake (notsuspended) but no applications are active, GSM consumed 22% of the overall power(backlight was turned off)
- Power consumed during text messaging was found to be 22% of the aggregate power(excluding backlight).
- A power reduction technique by guiding users indirectly to optimize their UElocations especially in indoor environments is proposed in [3]. The authors claim that this can also be understood as capacity increase in radio networks such as UMTS technology. This technique results in user distribution weighted more on high quality connection areas, which results in saving the UE batteries and reducing the overall radiation. The obtained results in this study show that the reception level of each location optimized mobile terminal can be increased 10–25 dB when short-term environmental changes of 6–10 dB due to moving persons in apartments are excluded.
- An architecture for receive diversity is proposed in [4] which significantly reducesthe power consumption compared to conventional approaches. The authors have shown that Power can be saved upto 30% in the radio front end, resulting in system level power reduction depending on environment it has similar performance as maximum ration combining. Minor modifications have to be made at the radio frontend. The performance of the proposed architecture is evaluated in multipath fading channels in terms of bit error rates
- Browsing of the web pages on the 3G connection using a novel approach to save the power in smartphones is discussed in [5].There are two techniques explained by author to achieve this. First approach is reorganizing the sequence of computing the web browser when loading a web page ,so that first computations are run by the web browser ,this results in generation of new data transmission and receiving these data from the web server, then the browser can put the interfaces of the 3G radio to low power state, releasing the radio resource and the remaining computations are run. Second approach was predicting the user reading times of the webpages by introducing a method based on

  

practical data mining i.e when the read time is greater than the threshold the smartphone is switched to low power state. The result of this experiment was that more than 30% of reduction in power consumption of the smartphones was achieved and 17% reduction in loading of web page is observed

- [10] "A Power-saving Standby Method to Extend Battery Life in Dual-mode Cellular Phones" presents Dual-mode cellular phones, including smart phones, Which shows how the traffic is deviated to avoid traffic concentration on 3G networks by letting the user to connect with fixed network through WLAN, more over connecting to both 3G and WLAN interfaces uses more power which less lessen the battery stand by time. To get longer battery life, they have proposed a power-saving standby method (PSSM) ,which have distinct traits such as: (1) except for when required ,constantly deactivating WLAN interfaces; (2) no additional functions in a mobile operator's network; and (3) avoiding of WLAN AP distant searching from a cellular phone.

## IV. CONCLUSION

The survey presented gives the power utilization analysis by smart phones in various scenario like Web surfing, voice call ,data call, processing of the data in the downlink direction in the optimized way and many other, as smart phones are becoming smarter in the generations to come, there lies the need to choose a better recipe for optimizing the utilization of power as this becomes the critical section with respect to any smartphone in particular the modem section, hence this survey is carried out ,where several ideas are discussed and optimizing the power consumption in smartphones are proposed.

## REFERENCES

[1] Aaron Carroll and Gernot Heiser, "An Analysis of Power Consumption in a Smartphone", USENIXATC'10 Proceedings of the USENIX conference on USENIX annual technical conference, 2010.

[2] Gian Paolo Perrucci, Frank H.P. Fitzek, Giovanni Sasso, Wolfgang Kellerer and Jorg Widmer, "On the Impact of 2G and 3G Network Usage for Mobile Phone's Battery Life", Wireless Conference, pp. 255-259, European, 2009.

[3] Jukka K. Nurminen, "Parallel connections and their effect on the battery consumption of a mobile phone", IEEE Consumer Communications and Networking Conference proceedings, pp. 1-5, 2010.

[4] Joonas Säe and Jukka Lempiäinen, "User Guided Energy and Capacity Optimization in UMTS Mobile Networks", IEEE 25th International Symposium on Personal, Indoor and Mobile Radio Communications, pp. 882-886, 2014.

[5] Vikram Chandrasekhar, Frank Livingston, Joseph Cavallaro, "Reducing dynamic power consumption in next generation DS-CDMA mobile communication receivers", IEEE Proceedings on the Application-Specific Systems, Architectures and Processors, pp. 260-270, 2003.

[6] Johannes W. Kunze, Attila Bilgic and Josef Hausner, "Adaptive Low Power Receive Diversity for LTE", IEEE proceedings on Radio and Wireless Symposium (RWS), pp. 661-664, 2010.

[7] Bo Zhao, Qiang Zheng and Guohong Cao, "Energy-AwareWeb Browsing in 3G Based Smartphones", IEEE 33rd International Conference on Distributed Computing Systems, pp. 165-175, 2013.

[8] Jad Nasreddine, Louffi Nuagmi and Xavier Lagrange, "Downlink Adaptive Power Control Algorithm for 3g Cellular Cdma Networks", 15th IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, Vol. 3, pp. 2192-2196, 2004.

[9] Harri Holma and Antti Toskala, "WCDMA FOR UMTS: Radio Access for Third Generation Mobile Communications", Third Edition

[10] Imai, N.; Yoshihara, K, "A Power-saving Standby Method to Extend Battery Life inDual-mode Cellular Phones," Consumer Communications and Networking Conference (CCNC), 2012 IEEE, Pages: 224 - 229, DOI: 10.1109/ CCNC. 2012. 6181091

  