J. Appl. Environ. Biol. Sci., 8(3)36-40, 2018

ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Analyzing Mobile Apps Energy Consumption

Pinial Khan Butt[1*], Entao LUO[2], Mubina Pathan[1], Irfan Ali Shahani[1], M. Khalid Shaikh[3], Zulfikar Ahmed Maher[1]

[1]Information Technology Centre, Sindh Agriculture University Tandojam, Pakistan
[2]School of Electronics and Information Engineering, Hunan University of Science and Engineering, Yongzhou 425199, China
[3]Department of Computer Science, The Federal Urdu University of Arts, Sciences & Technology

Received: November 4, 2017
Accepted: December 31, 2017

ABSTRACT

Smart phone user traffic has grown day by day higher and higher. Mobile phoneapps usage become practice to many users in everyday life. Now a day's android apps store market become more famous because free to download to use them. Mobile phone primarily run on battery power. You might notice battery life become short when many services actives such as Wi-Fi, CPU processing, gamming and display advertisement drain battery more quickly. Moreover, mobile phone mobile apps, a software application to run on mobile phone initially design for email, calendar and contact database. However, as public demand increases, and apps expand design for games, online banking and online shopping. Despite the growing popularity of mobile apps the energy consumed by mobile apps has poorly understood. In this paper, we argue display advertisement inefficiencies in mobile phone apps. In addition, we measure the power consumption by apps in mobile phone apps. We use the Battery mix app software to measure the power consumption and suggest solution to reduce the power consumption on mobile phone.
KEY WORDS: Network traffic, energy efficient, power consumption, mobile phones, green computing.

I. INTRODUCTION

Before mobile phone only can be used for phone calls specifically. Mobile phone is now used for multiple services purpose capable of voice and video communication, internet access, Mobile TV, camera and sensors (Accelerometer, geo-location) that can operate to some extent autonomously. In present the smart phone is gradually replacing the regular cell phone. The using of smart devices is increasing rapidly that gives idea that smart devices always connected (via Wi-Fi, 3G, and 4G). A manufacturer making smart devices power efficient making them handle this situation. However, there is still needs to improve the battery consumption make battery life longer. Battery life density increase only 30% to 40 % better than before recently[1]. We think about CPU demand in mobile increase double like clock speed. This area become research for researcher to analyze the battery consumption and find which service kills the battery. Despite the popularity of android devices, it is understood. There is still need to make android devices longer life. This deeply need more understand of power consumption in mobile app in smart device. We use the software to measure the power consumption. A M. Kummeretal. [2], it founds display advertisement inefficiencies in mobile apps consume up to 75% of mobile phone battery power. It is absorbed that third party app is not design for power efficient. Developer point out this deficiency in design and implementation of app and consider them as a bug. However, app developers can be weigh to optimize code to extend mobile phone battery life. Mobile phone apps display advertisement in apps generate money for developers without charging initial download of app. The test over running app on 3G service leave the connection open up to 10 secs after downloading information. Advertisement need to connect with the server and send the location information to server causes up to 45% consume power to find app user location. A reasonable delay in advertisement display in apps without halt quality of service advertisement can optimize mobile phone battery consumption. There are large body working on energy efficient and network activities in mobile phones. In addition, the most research focus on networking and operating system. To the best of knowledge, few of them study the mobile apps power inefficiencies. Purdue University team have use Eprof to measure the energy spent inside the apps[3]. They measure the power drain in browser, angry bird, fiches, ny times and map quest apps to measure the power drain during display and run time. However, there are thousands popular apps which are in mobile phone. Further, there is need to account few more famous apps problems measure there drain energy and provide a solution for this problem. Because the research results conclude that energy drain in apps due to free ads is more than double to actual energy use by apps itself[4]. We use ads blockers apps [5] which blocks un necessary free ads application which cause battery drain. We also count the power consume by mix battery app (application use to compute the power consumption of apps), QQ 2012[6], System User Interface[7] and cardiograph personal heart rate meter[8].Further a section 2 ,discuss the most famous mobile apps to measure their power consumption. Section 4, shows a comparisons of different apps power consumption results. Section 5, a conclusion o5f our research work.

***Corresponding author:** Pinial Khan ButtInformation Technology Centre, Sindh Agriculture University Tandojam, Pakistanpinial@sau.edu.pk

2. MATERIAL AND METHODS

MOBILE APPS

Mobile apps are pre-install at the time of manufacturing, can be download from various mobile software distribution platforms through web application through HTTP web browsers. The famous Nokia store [9] ,galaxy app store, amazon app store, apple app store, blackberry and google play store are available[10], mostly free to download apps.

Apple App store: Apple App store in maintain by Apple Inc. App store offers a categories to users includes social networks, gamming, entertainment and communication etc.

BlackBerry App World: BlackBerry App is design for BlackBerry smartphones you can download Simply from your BlackBerry® smartphone or computer and get started and enjoy the free and paid apps. Many applications are pre-loaded on new BlackBerry smartphones.

Google Play: Google plays introduced to access you are Android apps from Google Play. Google Play is maintained by Google which includes free and paid apps.

Nokia store: is design for apps for your Nokia device. You can discover apps games and more, especially developed for your Nokia device.

Accounting of Energy Consumption of Mobile APPS

A study carried by computer scientist Abhinav Pathak of Purdue University, Indiana revealed that free applications can consume a whopping 75% more energy than paid application mainly due to advertisement[11]. The mobile apps tracking user information to display advertisement consume cause shorter battery life. Team has discovering after creating Eprof[12], the first fine grained energy profiler for smart phone apps. The program tested on smart phone running Android and windows Phone.

In the research finding Angry Birds app [13] only 20 percent used to display and run the game. Remaining 45% percent is spent finding and uploading the user location with GPS, then downloading location-appropriate ads over 3 G connections[14]. The free application leaves connection opens about for 10 seconds even there is no data transmission and this tail energy consumes another 28 per cent of the apps energy.

Energy Consumption Measurement Of Mobile Apps

The mobile used in this paper is Samsung Google nexus Operating system Andriod 4.1.1[15]. We use the screen shots to show the results.

A. Battery budget for mobiles

The total capacity of battery power actually when device fully charge. When you watch you tube video on you are mobile you are pointing lot of mA (milliampere). Design of mobile phone is to fit to user pocket not to fit to support the big battery. This makes little size for battery life. Average battery size 820-1150 mAh (3.7 V).

B. Screen shots for measurements of apps

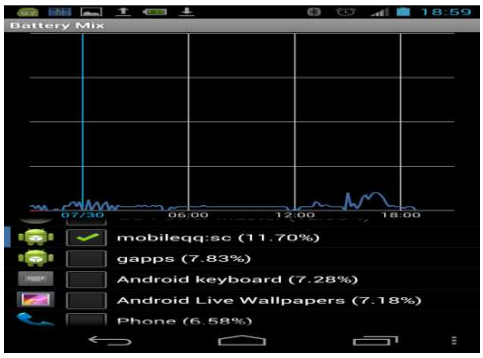

Fig.1 Mobile qq app energy consumption

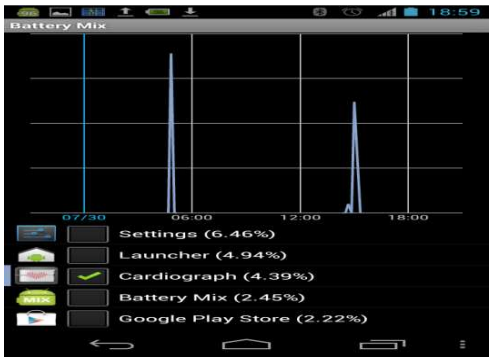

Fig.2 Cardiograph app energy consumption

Fig.3 Battery Mix app energy consumption

Fig.4 System UI app energy consumption

3. RESULTS AND DISCUSSION

We use the Battery mix app download from Google play store. It is used to monitor battery and process in android to run operating system mobile phone. To measure the running time and battery drain using QQ2012, Cardiograph and System UI foreground app use to user interface of mobile phone. To block the free ads in apps we use the AppBrain Ad Detector[16]. Which blocks the free ads in you are apps during running and display time. AppBrain is free app download from Google play.

Table 1. Mobile Apps usage Statistics results.

List of Apps	Description each apps	Time	Power consumption
Instant messaging	Chatting app	20 time / mins	11.70 %
E-Health app	Heart frequency rate	30 time / mins	4.39%
Power meter Setup	Record battery consumption	24 time / hours	2.45 %
Phone User interface	Record apps running in foreground and background	24 time / hours	13.89%

4. SOLUTION TO ENERGY EFFICIENT CONSUMPTION FOR MOBILE APPS

We all know how annoying Ads can be on the screen of you are android device. When we download free apps in our smart device. Even you do not know this free app contains the hidden software in the free apps to run the advertisement for companies. When we play games, these ads appear and drains the battery power unnecessarily. Now, I'll show you how to remove these ads from your Android phone, but keep in mind, there are different methods of blocking ads on rooted Androids and un-rooted Androids. While for rooted phones, all you have to do is install another app that takes care of the ads, on a un-rooted phone, the options are not that simple. This app is available on the Android Market and it's really effective. You don't have to spend too much time customizing it and it does the job really good (just download it from the Android Market and after install, click "Download & Install Hosts". Although, for AdFree to work on your phone, you have to have it rooted. AdFree[17] uses MVPS HOSTS file [18]to filter the information and add to its blacklist the ads. After installing AdFree you must install the HOSTS file and restart your device, you also have to restart after any custom change to the app (such as manually adding an ad address to the blacklist). The coolest feature of this app is the possibility to set it to update itself every day, so you never have to update it yourself. Another cool feature of AdFree[19]is that it blocks ads not only from your apps, but also from your Android browser [20]. At this time, other browsers are not supported. In this way we block unwanted ads from free apps and reduce power drain by these unwanted wake lock bugs.

5. CONCLUSION

In this paper. We research about the power drain in QQ 2012 , System UI , Cardiograph and Battery Mix mobile apps and give a solution to block the free ads in mobile apps because these free apps wake up the mobile phones and leave the connection open about 10 sec even they send no data. Which increase the tail energy and drain the battery more power. I propose there is some privacy policy for developers and app stores to communicate the knowledge about this to user of mobile. The smart device apps have ability to collect the data about users. Many free apps use the advertisement to continue to provide smart phone users free apps. These apps not only run unknown software in background and leak the user personal information. But also keep smart device wake up for long time which results drain smart device battery quickly than normal discharging rate.in this concert there must be organization body or control system in apps store that monitor and inform about this privacy risk to smart device user. They can know about this information when running these free apps. We can

reduce to risk to download free apps from well-known source app stores. These days are good for market placers because of there are no regulating privacy policy for mobile apps. The app developer is mobilizing to take action about privacy policy for mobile apps. There is no determining privacy policy about developer and app stores that put free ads in free mobile apps. Current era growing age of smart devices and millions of apps use by mobile users. This is big attraction for advertiser companies to put their ads in the smart devices they have seen especially a boast from of Google's Android platform. Where may free apps have been used by millions of users like angry bird and display free ads in you are screen. Mobile advertising presents an opportunity for new revenue streams. Advertisers are attracted to the sheer size of the audience. We think there is need to build a controlling organization body to need approval to upload these free apps to app store. These organizations address the privacy issues to mobile user's knowledge.

REFERENCES

[1] R. W. Ahmad, A. Gani, S. H. A. Hamid, M. Shojafar, A. I. A. Ahmed, S. A. Madani, K. Saleem, and J. J. Rodrigues, "A survey on energy estimation and power modeling schemes for smartphone applications," *International Journal of Communication Systems*, vol. 30, no. 11, 2017.

[2] M. Kummer and P. Schulte, "When private information settles the bill," 2016.

[3] S. Nakajima and M. Toyoshima, "Behavioral contracts for energy consumption," *Ada User Journal*, vol. 35, no. 4, pp. 266–271, 2014.

[4] R. Saborido, F. Khomh, G. Antoniol, and Y.-G. Guéhéneuc, "Comprehension of ads-supported and paid android applications: are they different?" in *Proceedings of the 25th International Conference on Program Comprehension*. IEEE Press, 2017, pp. 143–153.

[5] J.-Y. Pan and S.-H. Ma, "Advertisement removal of android applications by reverse engineering," in *Computing, Networking and Communications (ICNC), 2017 International Conference on*. IEEE, 2017, pp. 695–700.

[6] M. Xu, Y. Ma, X. Liu, F. X. Lin, and Y. Liu, "Appholmes: detecting and characterizing app collusion among third-party android markets," in *Proceedings of the 26th International Conference on World Wide Web*. International World Wide Web Conferences Steering Committee, 2017, pp. 143–152.

[7] Y.-W. Bai, H.-W. Su, and W.-C. Hsu, "Indoor and remote controls and management of home appliances by a smartphone with a four-quadrant user interface," in *Consumer Electronics (ICCE), 2017 IEEE International Conference on*. IEEE, 2017, pp. 319–320.

[8] M. Parpinel, L. Scherling, S. Lazzer, and V. Della Mea, "Reliability of heart rate mobile apps in young healthy adults: exploratory study and research directions," *Journal of Innovation in Health Informatics*, vol. 24, no. 2, pp. 224–227, 2017.

[9] C. Piot, "Hedging the future," *African Futures: Essays on Crisis, Emergence, and Possibility*, p. 104, 2017.

[10] G. Lee and T. S. Raghu, "Determinants of mobile apps' success: evidence from the app store market," *Journal of Management Information Systems*, vol. 31, no. 2, pp. 133–170, 2014.

[11] D. Li, R. Du, L. Cui, and G. Xing, "Klep: a kernel level energy profiling tool for android," in *IPSN*, 2017, pp. 305–306.

[12] A. Ogrezeanu, A. A. Purcarea, and A. Ogrezeanu, "Pathways for positive social impacts through designing communication strategy and tools within elearning projects," in *The International Scientific Conference eLearning and Software for Education*, vol. 2. " Carol I" National Defence University, 2017, p. 585.

[13] M. Böhmer, B. Hecht, J. Schöning, A. Krüger, and G. Bauer, "Falling asleep with angry birds, facebook and kindle: a large scale study on mobile application usage," in *Proceedings of the 13th international conference on Human computer interaction with mobile devices and services*. ACM, 2011, pp. 47–56.

[14] T. Wang, Z. Peng, S. Wen, Y. Lai, W. Jia, Y. Cai, H. Tian, and Y. Chen, "Reliable wireless connections for fast-moving rail users based on a chained fog structure," *Information Sciences*, vol. 379, pp. 160–176, 2017.

[15] T. Vidas and N. Christin, "Evading android runtime analysis via sandbox detection," in *Proceedings of the 9th ACM symposium on Information, computer and communications security*. ACM, 2014, pp. 447–458.

[16] M. Backes, S. Bugiel, and E. Derr, "Reliable third-party library detection in android and its security applications," in *Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security*. ACM, 2016, pp. 356–367.

[17] D. H. Reiley and N. M. Riabov, "Measuring consumer sensitivity to audio advertising: A field experiment on pandora internet radio," 2017.

[18] G. Merzdovnik, M. Huber, D. Buhov, N. Nikiforakis, S. Neuner, M. Schmiedecker, and E. Weippl, "Block me if you can: A large-scale study of tracker-blocking tools," in *Security and Privacy (EuroS&P), 2017 IEEE European Symposium on*. IEEE, 2017, pp. 319–333.

[19] M. Barker, L. Bridges, M. Esiri, and A. H. Hainsworth, "A vasculocentric pattern of axonal damage and neurofilament phosphorylation in subcortical white matter of older people," *Alzheimer's & Dementia*, vol. 13, no. 7, pp. P1305–P1306, 2017.

[20] D. Haugh, "Mobile applications for libraries," *Developing In-House Digital Tools in Library Spaces*, p. 76, 2017.