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Study on Problem And Possible Solutions of Android Fragmentation

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ABSTRACT

This paper discusses about the problem of fragmentation in Android operating system. Fragmentation will be discussed along with how the problem of fragmentation is unavoidable for an operating system like Android. This paper will also discuss the causes, troubles caused and proposed solutions due to the fragmentation problem in Android.

KEYWORDS– Android, Fragmentation, Android Version

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INTRODUCTION

Android is an open source operating system designed for smart devices like phones wearables and tablets. This openness of the code is what attracts the developers towards making more and more apps for the platform or operating system used by the majority of smartphone users. Other than smartphones most of the smart devices like wearables, tablets, smart televisions etc. have been using Android as their core operating system. But the main problem with Android is the problem of fragmentation. Fragmentation deals with different versions of Android running on devices manufactured by different companies.

For the solution of the problem of Android fragmentation, Google has devised methods like Android Compatibility Program and Project Treble. With Android Compatibility Program Google expects developers to port its apps to different devices and versions to test for bugs while Project Treble deals with the problem of fragmentation by changing the way how hardware of the device communicates with the underlying software layer. In addition to these two methods the other proposed methods will be discussed that are already published in other research works.

ANDROID FRAGMENTATION

Android fragmentation is a term for a wide number of concepts. Mostly it is used to refer to describe the different versions of Android running on different devices. Fragmentation sometimes is also used to describe the issues regarding different skins put up by different manufacturers on top of the vanilla android and the delay in providing security patches provided by Google. Android fragmentation is divided into two types : Operating system fragmentation and Device fragmentation. Former one deals with the inconsistencies due to different versions of the Android OS running on different devices while the latter one deals with the issues caused due to different types of hardware and API mismatch due to different manufacturers making different devices. In this paper the problem of Operating system fragmentation will be discussed.

The above diagram is enough to show that even after the release of latest Android version Pie (9.0) most of the devices are running on dated versions of Android. Cause of the Android fragmentation will be discussed in the next section.
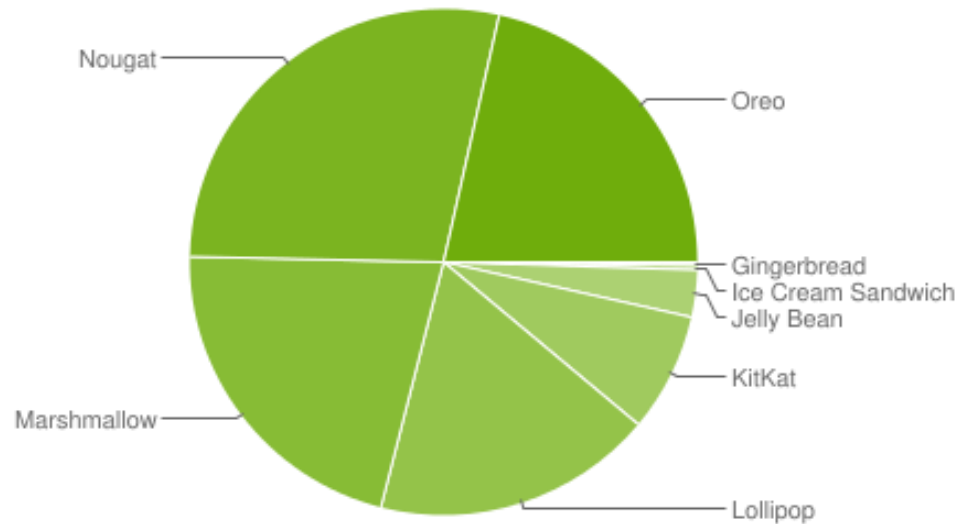
Fig.1 Pie chart diagram of different versions of Android being used till October 26, 2018 (source: android.com)

CAUSE OF ANDROID OPERATING SYSTEM FRAGMENTATION

The problem of Android OS fragmentation is due to release method of the new Android version by Google. Google releases the new version of Android with the name Android Open Source Project (AOSP). Being open-source anyone can make a custom version of the same code by changing user interface or other modifiable elements of AOSP. Various OEMs apply their proprietary skin in their device on the top of AOSP.

Some device manufacturers like One plus and Motorola barely make changes to the UI of the AOSP released by Google. This makes the update process more streamlined. But most of the Android OEMs like Samsung, Huawei, Xiaomi etc. apply their skin on the top of AOSP. So, whenever Google releases the new version of Android the OEMs have to apply their skin on the new version and test it which requires a lot of efforts which most of the OEMs are not interested in due to the release of new devices by them rather than focusing on older devices.

OEMs' reasoning for applying the skin on the top of vanilla android (AOSP) is that the skin creates a unique place for the brand in the Android.

Fig.2 Screenshots of different skins (Samsung's Touch wiz and Xiao MI's MIUI) and Vanilla AOSP respectively

PROBLEMS DUE TO ANDROID FRAGMENTATION

Some problems caused due to Android fragmentation are discussed below:

1.) No access to the latest technology: Technologies like A R core and Google's HDR+ works with only Android version 7 (nougat) and above

2.) Lack of latest security patches: Slow or no updates make devices vulnerable to new risks due to the device not being updated to latest security patch provided by Google.

3.) Lack of commitment of users to a certain brand of devices: Slow pace of updates by OEMs make the customer not so loyal to the brand.

4.) Inconsistencies with the app layout for devices by different OEMs: While developing an app the developer may test the app on the vanilla Android device and it may run fine but running it on the device with the Android skin on it may cause some UI issues on that device.

PROPOSED SOLUTIONS TO ANDROID OPERATING SYSTEM FRAGMENTATION

Considering Android fragmentation a serious problem, Google and developers/researchers have come up with the solutions and ideas to tackle with the problem. Some of them are discussed below:

1.) Android Compatibility Program: It is a program developed by Google so that OEMs can make applications that are compatible among different devices. It includes Compatibility Test Suite (CTS) which is a set of tests needed to be passed to use Google's services like maps, search

etc. But the problem with this program is that the criteria for passing the tests is not clear. So, still the problem of fragmentation exists.

2.) Device API Test level method: This is a method devised by Je-Ho Park, Young Bom Park and Haying Kill Ham. In this approach the problem of fragmentation is detected at the software (API) level. The problems detected with this method are the inconsistencies of Android API on devices manufactured by different OEMs. The API is tested over different devices and the results of the tests are stored in the database. Now that database will be used to compare for expected fragmentation problems.

3.) Project Treble: Project Treble is the latest initiative by Google to solve the problem of Android OS fragmentation. The real reason why it takes so long for the manufacturers to push the latest update of Android version is due to the difficulties in making the operating system communicate with the hardware. So Google's latest offering "Project Treble" is the answer. Earlier, that is before introduction of Android 8.0 (Oreo) the Android i.e. the higher software layer and lower level software level were part of the same code. So both of them had to be updated for a total updated but with Project Treble starting with Android 8.0 (Oreo), Google has differentiated between two layers of software. So, Android version can be updated with or without the need for updating of the low level software.
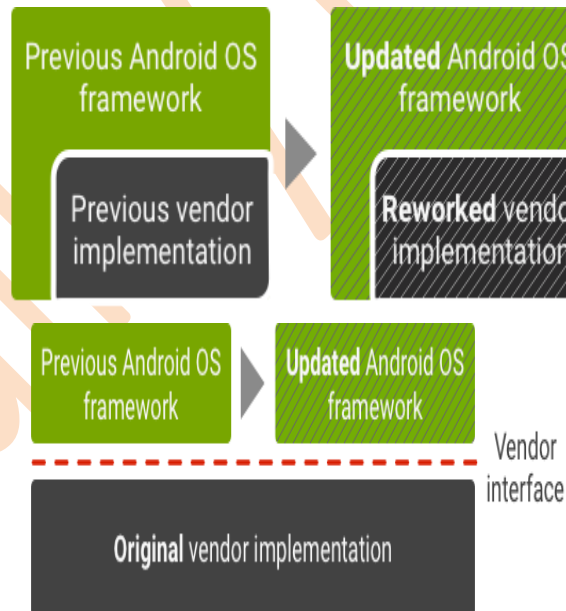
Fig.3 Diagram of how updates used to be before and after Project Treble respectively

CONCLUSION

In this paper definition, issues and causes of Android OS fragmentation are discussed. Some methods are also discussed to streamline the update process of Android. With the new versions of Android OS, Google and developers can work in collaboration to make the Android.

REFERENCES

1. Android.com, 'Google Android'. [Online]. Available: http://www.android.com/

2. Androidauthority.com 'What is Android fragmentation, and can Google fix it?' Available: https://www.androidauthority.com/android-fragmentation-google-fix-it-713210/

3. JH Park, YB Park, HK Ham, 'Fragmentation problem in Android', *2013 International Conference on Information Science and Applications (ICISA)*. IEEE, 2013

4. Howtogeek.com, 'What is project treble on Android and will my phone get it?'. Available: https://www.howtogeek.com/344590/what-is-project-treble-on-android-and-will-my-phone-get-it/

5. Source.android.com, 'Android Design Architecture'. Available: https://source.android.com/devices/architecture

6. Source.android.com'CompatibilityTestSuite'.Availablettp://source.android.com/compatibility/cts-intro.html