7th National Conference on
"Role of Engineers in Nation Building" organized by VIVA Institute of Technology, Mumbai
(1st and 2nd March 2019)
International Journal of Engineering Research & Science (IJOER)
ISBN: [978-93-5321-411-1] ISSN: [2395-6992] [Vol-5, Issue-3, March- 2019]

A version to improve application launch performance in android device

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Abstract*—For smartphone users, application launching time, which is period from the time of application icon touch by a user to time at which the application starts interacting with the user, is one of the most important performances for comfortable uses. In this paper, we focus on Android version and discuss android version for measuring application launching time and decreasing launching time. First, we introduce a method for measuring application launching version by inserting monitoring functions into the Android operating system. In this, we are the focus on android version and their features and we present our measurement result of application launching time also focused on the way of decreasing application launching performance. It expands the list of the preloaded version by adding standard classes. Last, we present our evaluation results and demonstrate that the proposed method can improve launching performance.*

Keywords-- Android version, API, application performance, codename, supported technology.

I. INTRODUCTION

Android is a mobile operating system developed by Silicon Valley company by Android Ice. It is developed by Google in 2007 collaboration spearheaded through the OHA (Open Handset Alliance).

What is Open Handset Alliance (OHA)?

It's a combine of 84 companies such as Google, Samsung, AKM, Synaptic, Garmin, Teleca, eBay, Intel etc. It was established on 5th Nov 2007, led by Google. It provides services and deploys handsets using the Android Platform. The first version of Android is 1.0, was released in 2008, Android is developed by Google. After that, the 2009's android 1.5 Cupcake is released. The most recent version of Android is Android 9Pic, which was released in August 2018.Android is a mobile OS developed by Google. It is based on a modified version of the Linux kernel and other open source software and IT and is designed primarily for touchscreen mobile devices such as smartphones and tablets and another many device.

Features of Android

The important features of Android are:

- It is an open-source.
- Anyone can personalize the Android Platform.
- It provides many interesting features like weather details as per user location, lives RSS (Really Simple Syndication) feeds, date and time etc.
- It supports and provides for messaging services like SMS and MMS, web browser, storage (SQLite), connectivity like GSM, CDMA, Blue Tooth, Wi-Fi etc., media, handset layout etc.

Fig. 1 Versions of android

International Journal of Engineering Research & Science (IJOER)
ISBN: [978-93-5321-411-1] ISSN: [2395-6992] [Vol-5, Issue-3, March- 2019]

Table 1
Versions of Android

VERSION	CODE NAME	API LEVEL	RELEASE DATE
1.5	Cupcake	3	April 27, 2009
1.6	Donut	4	September 15, 2009
2.1	Éclair	7	October 26, 2009
2.2	Froyo	8	May 20, 2010
2.3	Gingerbread	9 AND 10	December 6, 2010
3.1 and 3.3	Honeycomb	12 AND 13	February 22, 2011
4.0	Ice Cream Sandwich	15	October 18, 2011
4.1,4.2,4.3	Jelly Bean	16,17 AND 18	July 9, 2012
4.4	Kit Kat	19	October 31, 2013
5.0	Lollipop	21	November 12, 2014
6.0	Marshmallow	23	October 5, 2015
7.0	Nougat	24-25	August 22, 2016
8.0	Oreo	26-27	August 21, 2017
9.0	Pie	28	August 6, 2018

II. VERSIONS OF ANDROID

2.1 Android 1.0 (API 1)

Android 1.0, the first version of the android, was released on September 23, 2008.

The first developed by the HTC Dream.

Android 1.0 following features:

- Application downloads and updates through the Market application
- Camera support – however, this version lacked the option to change the camera's resolution, low Resolution and picture quality etc.
- In the folder, multiple icons are present in the signal folder.
- Access to web email servers, supporting POP3, IMAP4, and SMTP server.
- Instant messaging, text messaging, and MMS
- Media Player, enabling management, importing, and playback of media files, this version lacked video and stereo Bluetooth support
- Notifications appear in the Status bar above of mobile monitor, with options to set ringtone, LED or vibration alerts also there.
- Voice Dialer allows dialing and placing of phone calls without typing a name or number of the customer.
- Wallpaper allows the user to set the background image to the mobile and set as wallpaper and also the YouTube video player
- Other applications include: Alarm Clock, Calculator, Dialer, Home screen, Pictures, and Settings and other application
- Wi-Fi and Bluetooth support in the mobile.
- Gmail synchronization with the Gmail application.

Suggestion: Improvise Camera resolution quality. All icons are display one full screen not in one single folder. Need to improve user interface [1].

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2.2 Android 1.5 Cupcake (API 3)

On April 27, 2009, Android 1.5 update version was released based on Linux kernel 2.6.27.

This was the first release to officially use a codename based on a dessert item name is ("Cupcake"), a theme which would be used for all releases henceforth of android.

The update included several new features and UI amendments in this system.

Features:

- It Support for third-party virtual keyboards with text prediction and user dictionary for custom words.
- Support for Widgets.
- Miniature application views that can be embedded in other applications and other device and receive periodic updates.
- Video recording and playback in MPEG-4 and 3GP formats also play the play video in mp3 and 4 formats.
- Auto-pairing and stereo support for Bluetooth.
- Copy and paste features in the web browser.
- User pictures shown for Favourites in Contacts.
- Specific date/time stamp shown for events in call log when the call comes and one-touch access to a contact card from the call log event.
- Animated screen transitions and transparent.
- Auto-rotation option available.
- New stock boot animation.
- Ability to upload videos to YouTube.
- Ability to upload photos to Picasa.
- Suggestion: This version improves the performance of the functionality. [2][4]

2.3 Android 1.6 Donut (API 4)

On September 15, 2009, Android 1.6 – dubbed Donut version– was released, Google based on Linux kernel 2.6.29.

Features:

- Voice and text entry search enhanced to include History, note bookmark, contacts, and web access,
- The ability for developers to include their content in search results as per the user requirement.
- Multi-lingual speech synthesis engine to allow any Android application to "speak" a string of text and voice into the text.
- Easier searching and ability to view app screenshots as per requirement in Android device.
- Gallery, camera and camcorder more fully integrated, with faster camera access in the device.
- The ability for users to select multiple photos for deletion in the device.
- Updated technology support for CDMA/EVDO, 802.1x, VPNs, and speech engine, when any text user can enter the search engine.
- Support for WVGA screen resolutions.
- Speed improvements in searching and camera applications and the quality.
- Expanded Gesture framework and new Gesture Builder development tool available in this device. [4]
- Suggestion: Need to improve security feature and need to improve user interface [3][4].

International Journal of Engineering Research & Science (IJOER)
ISBN: [978-93-5321-411-1] ISSN: [2395-6992] [Vol-5, Issue-3, March- 2019]

2.4 Android 2.1 Eclair (API 5)

On October 26, 2009, the Android 2.0 SDK was released Google, based on Linux kernel 2.6.29

Features:

- Expanded Account sync in this version, allowing users to add multiple accounts to a device for synchronization of email and contacts in this version.
- Microsoft Exchange email support, with a combined inbox to browse email from multiple accounts in one page and easily handle
- Bluetooth 2.1 support
- Ability to tap a Contacts photo and select to call, SMS, or email the person and record.
- Ability to search all saved SMS and MMS messages, with delete oldest messages in a conversation automatically deleted when a defined limit is reached and see the data sap per date.
- Numerous new camera features, including flash support, digital zoom, scene mode, white balance, color effect and macro focus in this version [4].

2.5 Android 2.3 Gingerbread (API 9)

On December 6, 2010, the Android 2.3 (Gingerbread) SDK was released, based on Linux kernel 2.6.35. Changes included.

Updated user interface design with increased simplicity and speed user can easily interface.

Features:

- Support for extra-large screen sizes and resolutions screen and higher speed.
- Faster, more intuitive text input in the virtual keyboard, with improved accuracy, better-suggested text and voice input mode and search.
- Copy/paste functionality, allowing users to select a word by press-hold, copy and paste any information in the device.
- Support to Near Field Communication, one place to the nearest place allowing the user to read an NFC tag and embedded in a poster, sticker, or advertisement.
- New audio effects such as reverb, equalization and headphone virtualization, and bass boost and good sound quality in this version.
- New Download Manager, use of giving users easy access to any file downloaded from the browser, email, or another application and access any data in the android device.
- Support for multiple cameras on the device, including a front-facing camera, if available as per user requirement.
- Improved power management and power battery backup with a more active role in managing applications that are keeping the device awake for too long.
- Enhanced support for native code development.
- Switched from YAFFS to ext4 on newer devices.
- Audio, graphical, and input enhancements for game developers also provided good animation.
- Concurrent garbage collection for increased performance and work faster [4].

2.6 Android 3.0 Honeycombs (API 11)

On February 22, 2011, the Android 3.0 SDK –the first tablet-only Android update – was released Google, based on Linux kernel 2.6.36.

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The first device featuring this version, the Motorola Zoom tablet, was released on the date of February 24, 2011.

Features:

- Added Action Bar, giving access to contextual options, and other operation navigation, widgets, or other types of content at the top of the screen
- Multitasking tapping Recent Applications and recent use application in the System Bar allows users to see snapshots of the tasks underway and quickly jump from one application to another and the access to any application easily.
- Redesigned keyboard, making typing fast, efficient and accurate on larger screen sizes and handle all the application easily [4].

2.7 Android 4.0 Ice Cream Sandwich (API 14)

The SDK for Android 4.0.1 (Ice Cream Sandwich), is based on Linux kernel 3.0.1, it was publicly released on October 19, 2011.

Features:

- Major refinements to the "Hole" interface with new Robot font family and user-friendly.
- Soft buttons from Android 3.x are now available for use on all phones.
- Separation of widgets in a new tab, listed in a similar manner to applications and app.
- Easier-to-create folders, with a drag-and-drop style.
- Improved visual voicemail with the ability to speed up and slow down voicemail messages in the device.
- Pinch-to-zoom functionality in the calendar and information.
- Integrated screenshot capture and data.
- Improved error correction on the keyboard and virtually.
- Ability to access applications directly from the lock screen.
- Improved copy and paste functionality.
- Better voice integration and continuous, real-time speech to text dictation in the device.
- Android Beam, a near-field communication feature allowing the rapid short-range exchange of web bookmarks, contact info, directions, YouTube videos and other data using intent.
- Support for the Web image format.
- Hardware acceleration of the UI user interface. Wi-Fi Direct.
- 1080p video recording for stock Android devices.
- Android VPN Framework (AVF), and TUN (but not TAP) kernel module. Prior to 4.0 and VPN software required rooted Android. To communicate to the UI framework to the Linux hardware device [3].

2.8 Android 4.1 Jelly Bean (API 16)

Google louche Android 4.1 (Jelly Bean) at the Google I/O conference on June 27, 2012. Based on Linux kernel 3.0.31, and Jelly Bean was an incremental update with the primary aim of improving the functionality and performance of the UI. The performance Will improvement involved "Project Butter", which uses touch anticipation, triple buffering, extended sync timing and a fixed frame rate of 60 fps to create a fluid and UI Android 4.1 Jelly Bean was released to the Android Open Source Project on 2012, and the Nexus 7tablet, the first device to run Jelly Bean, was released on July 13, 2012.

Features:

- Smoother user interface and sync timing across all drawing and animation done by the Android framework, including application rendering, touch events, screen composition and display refresh on time to time.
- Enhanced accessibility Bi-directional text and other language support in this version.

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- User-installable keyboard maps Expandable notifications.
- Ability to turn off notifications on an application-specific basis as per user requirement.
- Widgets can automatically be re-arranged or re-sized to allow new items to fit on home screens in the display as par the screen resolution.
- Bluetooth data transfer for Android Beam and faster.
- Tablets device with smaller screens now uses an expanded version of the interface layout and home screen used by phones.
- Improved camera application Multichannel audio and video.
- The ability for other launchers to add widgets from the application drawer without requiring root access to the user. [3]

2.9 Android 4.4 Kitkat (API 19)

Google launched Android 4.4 Kit Kat on September 3, 2013. Although initially under the "Key Lime Pie" codename, the name was changed because "very few people actually know the taste of a key lime pie." And Some technology bloggers also expected "Key Lime Pie" release to be Android 5 version.

Features:

- The ability for applications to trigger translucency in the navigation and status bars for a user guide.
- The ability for applications to use "immersive mode" to keep the navigation and status bars hidden while maintaining user interaction to the UI.
- Action menu buttons are always visible, even on devices with a "Menu" key, which was officially deprecated by Android 4.0 version.
- Restriction for applications when accessing external storage, of data except for their own directories.
- Wi-Fi and mobile data activity indicators are moved to quick settings
- Disables text wrapping in the Web View browser component. To access the web content [1][4].

2.10 Android 5.0 Lollipop (API 21)

Android Lollipop is a codename the Android mobile OS developed by Google, spanning versions and between 5.0and 5.1.1. As of October 2018, statistics issued by Google indicate that the Lollipop versions have 17.9% share combined of all Android devices accessing Google Play store.

Features:

- Google released Android 5.0 Lollipop, the largest Android update.
- The new Material Design in this version.
- A new lock screen is available
- Hide sensitive content in notifications and information
- Get longer battery life with a battery-saver mode.
- Hang a Do Not Disturb sign features.
- Add Trusted Devices for a user.
- You can now search Settings [4].

2.11 Android 6.0 Marshmallow (API 23)

Android 6.0 "Marshmallow" this is the sixth major version of the Android OS. and the 13th version of Android. This version provides updated feature does not available in old version features.

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Features:

- Marshmallow is the version of Android which reduces CPU speed and time while the screen is off then this will used for the purpose of save the battery of life of a device.
- It provides application search bar feature.
- It provides native fingerprint reader support for the security purpose.
- This version provides direct Share feature so this is used for sharing the app.
- During the time of factory reset, it's an automatic backup and restores the app [4].

2.12 Android 9.0 Pie (API 28)

Android Pie is the ninth major version of the Android OS. It was announced by Google on March 7, 2018. The final beta of Android P version was released on July 25, 2018.

Features:

- New user interface for the quick settings menu search setting.
- The clock has moved to the left of the notification bar in the home screen.
- The "dock" now has a semi-transparent background screen.
- Battery saver no longer shows a color be an orange overlay on the notification and status bars and notification.
- A "screenshot" button has been added to the power options at one click tack a screenshot.
- A new Lockdown mode which disables biometric system authentication once activated. Rounded corners across the UI
- New transitions for switching between apps, or activities within applications.
- Richer messaging notifications, where a full conversation can be had within a notification, full-scale images, and smart replies akin to Google's new app, Reply Support for display counts.
- Redesigned volume slider
- Battery percentage now is shown in Always-On Display
- Vulcan 1.1 support [3][4]

III. FUTURE WORK

Lock screen security changes include the possible return of an improved Unlock system.

Experimental features such as a redesigned About Phone page in settings, and additional and automatic Bluetooth enabling while driving the car.

A new optional gesture-based system interface, allowing users to navigate the OS using swipes more often than the traditional user interface.

Redesigned multitask application switcher with Google search bar and app drawer built in.

Android Dashboard, which tells the user how much time you're spending on your device and how much you use it and in apps, and allows the user to set time limits on apps

An enhanced version of DND mode activated by placing the phone face down and any other activity, which mutes standard notifications on time.

Adaptive Battery prediction, which makes use of Doze to hibernate user application the OS determines the user will not use additional battery.

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Auto Brightness feature modifies screen brightness based on as par user habits.

Wind Down option lets Android users set a specific bedtime that enables DND and turns the entire phone's interface gray to discourage further use at night.

IV. CONCLUSION

I've learned through my research that Android version a much more diverse operating system than iOS and Windows Phone Mobile. Android has grown rapidly from the last 4 years and android become a most used smartphone. It's because Android doesn't release 1 phone from 1 company with 1 new OS every year, but countless phones from numerous companies, adding their own twist, throughout the year, developing gradually day-by-day. I am not saying that Android is good or bad than one OS, but it's provided uniqueness functionality than another OS [5]

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