

Recent Versions on Android and survey on the versions Lollipop, Marshmallow and Nougat

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Abstract— In this era, due to the rapid increase in the number of smartphone users and mobile applications. The Smartphones are expected to have PC-like functionality, but hardware resources such as CPU's, memory and batteries are still limited. To solve this resource problem various and different versions of Android operating system is introduced from past few years. Android is continually developed by Google and the Open Handset Alliance, and it has seen a number of updates to its base operating system since the initial release. This paper aims on to give the best details toward the exciting new frontier of open source mobile development and their different versions on Android. As the cell phone utilization is expanding step by step, individuals are expecting a ton from their cell phones by expanding dependability, security, execution along these lines numerous this sorts of characteristics. So, as the different versions are introduced these characteristics are also changed and evolved. Nougat is the most recently introduced version of the Android where it provides notable changes to the operating systems and their developing platform. The new version of Android Nougat is already available on many devices. Twelve major versions have been released since Android OS launch in 2009. Currently most of all Android-based devices use one of five versions: Jelly Bean, KitKat, Lollipop, Marshmallow and Nougat. Android Nougat is that version of android developed by Google which recovers the all drawbacks of marshmallow and also it contains extended features. The survey of different versions of android and their uses are seen in this paper.

Keywords—Lollipop, Marshmallow, Nougat, Oreo.

Introduction:

This research has been done to give you the best details toward the exciting new different versions of Android. The computer has been in constant evolution since the middle of the 20th century. Computers are continued to get smaller in size, using less power and performing more advanced calculations. In 2007 Apple released their iPhone to achieve the next goal in computing. This new type of communication tool, called Smartphone. One competitor to Apple iPhone OS is the Android OS. Android originates from a small software company, acquired by Google and is now owned by Open Handset Alliance (OHA), where Google is a member. Driven through the Apache License, anyone can use the Android Software Development Kit (SDK) to develop applications to run on the Android OS. The first commercial version, Android 1.0, was released in September 2008. Android is continually

developed by Google and the Open Handset Alliance, and it has seen a number of updates to its base operating system since the initial release. Nougat is the most recently introduced version of the Android where it provides notable changes to the operating systems and their developing platform. The new version of Android Nougat is already available on many devices. Twelve major versions have been released since Android OS launch in 2008.

Code name	Version number	Initial release date
Alpha	1.0	September 23, 2008
Beta	1.1	February 9, 2009
Cupcake	1.5	April 27, 2009
Donut	1.6	September 15, 2009
Eclair	2.0 – 2.1	October 26, 2009
Froyo	2.2 – 2.2.3	May 20, 2010
Gingerbread	2.3 – 2.3.7	December 6, 2010
Honeycomb	3.0 – 3.2.6	February 22, 2011
Ice Cream Sandwich	4.0 – 4.0.4	October 18, 2011
Jelly Bean	4.1 – 4.3.1	July 9, 2012
KitKat	4.4 – 4.4.4	October 31, 2013
Lollipop	5.0 – 5.1.1	November 12, 2014
Marshmallow	6.0 – 6.0.1	October 5, 2015
Nougat	7.0 – 7.1.2	August 22, 2016

II. SURVEY STUDY

There are many different versions of Android and their many different updates of these Androids. Android is an open source Linux based system developed by Google, and primarily aimed at mobile handsets and other portable devices. In short, we will be using them to accomplish our daily task. The survey done helps in understanding the different versions of android and their different form of operations at different level of update. As the update for different versions went on the Android Smartphone's became much user friendly. Lollipop and Marshmallow had the lot of differences in its uses and its applications. Now, Nougat is the latest version which is used generally by most of the user. Nougat came up with a split screen method where multiple applications can be made to run at one time. So in this way the survey of different versions are done at different level of updating.

COMPARITIVE STUDY:

Android Marshmallow v/s Android Lollipop:

With Lollipop's Project Volta, Google laid the foundations for longer battery life. Android Marshmallow goes one step further, with a battery saving function known as Doze. With Android Marshmallow, there is finally an integrated way to manage app permissions. In Lollipop you had to allow all app permissions before you downloaded the app from the Play Store. In Android Marshmallow, this is no longer the case. Instead, you can allow or deny app permissions individually, as and when you want a specific function to work. With Android Marshmallow, Google has finally created a uniform standard for fingerprint sensors. Marshmallow also came up with App Linking facility for faster instinctive opening of links with corresponding applications, Larger Application folders with multiple pages. Post-install/run-time permission requests. USB Type-C support, Demo Mode feature for screenshot-capture usage, Automatic full data backup and restore for apps, 4K display mode for apps. Adoptable External storage to behave like Internal Storage, MIDI support for musical instruments, Experimental multi-window feature, App permissions now granted individually at run-time, not all-or-nothing at install time. Unicode 7.0 & 8.0 emoji support. Descriptions for USB connection options, New navigation bar layout for the Google Pixel C, Double-tap power button to open camera.

Android Nougat v/s Android Marshmallow:

Android Nougat introduces a split-screen display mode for phones, in which two apps can be snapped to occupy halves of the screen. An experimental multi-window mode is also available as a hidden feature, where multiple apps can appear simultaneously on the screen in overlapping windows. The notification shade was redesigned, featuring a smaller row of icons for settings, replacing notification cards with a new "sheet" design, and allowing inline replies to notifications (this feature is implemented via existing APIs that are used for similar functionality on Android Wear). Multiple notifications from a single app can also be "bundled", and there is greater per-app control over notifications. The "Doze" power saving mechanism introduced in Android Marshmallow was expanded to include a state activated when the device is running on battery and the screen has been off for a period of time but is not stationary. In this state, network activity is restricted, and apps are granted "maintenance windows" in which they can access the network and perform background tasks. As in Marshmallow, the full Doze state is activated if the device is stationary with its screen off for a period of time. A new "Data Saver" mode restricts background mobile data usage, and can trigger internal functions in apps that are designed to reduce bandwidth usage, such as capping the quality of streaming media. So in this way the nougat came up with different updation and by increasing the efficiency of Android.

DRAWBACKS AND RECOVERED METHODS:

As the update for every version takes place the newer versions comes up by removing the disadvantages of the previous versions of android. Nougat introduces a system for enabling "seamless", automatic system updates, based upon and sharing some code with the implementation of similar functionality on Chrome OS. The system uses a pair of SquashFS partitions; the Android system executes from an "online" partition, while updates are applied in the background to a redundant "offline" partition. On the next boot following the installation of an update, the redundant partition is designated as active, and the device henceforth boots into the updated system. The previous system partition is kept as a backup in case of update failure, and to serve as the "offline" partition for the next update. This system removes the requirement for the device to reboot into the system recovery environment to apply the update (which prevents the device from being used until the update is complete) and also provides the ability for an update to be automatically rolled back in case of a failure. Due to the partitioning requirements of this system, existing devices will not support seamless updates. Additionally, due to the ART changes on Nougat, apps no longer need to be re-compiled upon the first boot after a system update. Android 7.1 adds native API support for implementing image keyboards; multi endpoint telephony; shortcut menus and rounded icon assets for apps on launchers; and support for the Google Daydream virtual reality platform. The Google Daydream feature is a specific "VR mode", with advanced technology for reduced graphics latency, a "sustained performance mode" to assist developers in optimizing apps to a devices thermal profile, a new head tracking algorithm which combines the input from various device sensors, and integration of system notifications into the VR user interface. The Security upgradation also played a vital role in the Nougat version of Android where In response to the Stage fright family of bugs disclosed and fixed in 2015, several changes were made to harden the media stack against future vulnerabilities. Runtime integer overflow detection was implemented, preventing the majority of Stage fright-like programming bugs from becoming vulnerabilities in addition to helping fix and prevent such bugs. Android's monolithic Media Server process was redesigned to better adhere to the principle of least privilege. Media Server is now split into several separate processes, each running in its own unprivileged sandbox, and granted only the permissions required for its task. For example, only the Audio Server can access Bluetooth, and libstage fright now runs within the Media Codec Service sandbox, which is only granted GPU access. Further constraints were placed on the media stack through seccomp. Various mechanisms were enabled to reduce the possibility of malicious code being injected and/or executed inside the Linux kernel, including dividing kernel memory into logical segments for code and data, with page access permissions of read-only and no-execute as appropriate. The kernel was also restricted from directly accessing user space memory, and stronger stack protection

was enabled in the GCC compiler to reduce stack smashing. To limit exposure of the kernel to potentially malicious code, perf was disabled by default, IOCtl commands were restricted by SELinux, and seccomp-bpf was enabled to grant processes the ability to restrict system calls. On devices shipping with Android Nougat, the "Verified Boot" policy (introduced partially on KitKat, and displaying notifications on startup on Marshmallow) must be strictly enforced. If system files are corrupted or otherwise modified, the operating system will only allow operation in a limited-use mode or refuse to boot.

Android Version	Version name	Feature
5.0	Lollipop	<ul style="list-style-type: none"> • Material Design • Improved Notification • Better Battery Life • Project Volta • Continuit • Security • Performance Improvements
6.0	Marshmallow	<ul style="list-style-type: none"> • USB Type C • Adopted storage • Now on tap • System UI Tuner • Fingerprint sensors

ADDITIONAL ADVANCE FEATURES OF THE NEXT ANDROID VERSION OREO

Google introduced its latest mobile operating system, Android 8 Oreo, in 2017 bringing several advanced features like enhanced security, picture-in-picture support for video, performance improvements and battery usage optimization, and support for autofillers, Bluetooth 5, system-level integration with VoIP apps, wide color gamuts, and Wi-Fi Aware. Android Oreo also introduces two major platform features: Android Go - a software distribution of the operating system for low-end devices - and support for implementing a hardware abstraction layer.

A. User experience

Notifications can be snoozed, and batched into topic-based groups known as "channels". Android Oreo contains integrated support for picture-in-picture mode. The "Settings" app features a new design, with a white theme and deeper categorization of different settings, while its ringtone, alarm and notification sound settings now contain an option for adding custom sounds to the list. The Android 8.1 update supports the display of battery percentages for connected Bluetooth devices, makes the notification shade slightly translucent, and dims the on-screen navigation keys in order to reduce the possibility of burn-in.

B. Platform

Android Oreo adds support for Neighborhood Aware Networking (NAN) for Wi-Fi based on Wi-Fi Aware, Bluetooth5, an API for autofillers, multiprocess and Google Safe Browsing support for WebViews, an API to allow system-level integration for VoIP apps, and launching activities on remote displays. Android Runtime (ART) features performance improvements and better cache handling. Android Oreo contains additional limits on apps' background activities in order to improve battery life. Apps can specify "adaptive icons" for differently-shaped containers specified by themes, such as circles, squares, and squircles. Android Oreo supports new emoji that were included in the Unicode 10 standard. A new emoji font was also introduced, which notably redesigns its face figures to use a traditional circular shape, as opposed to the "blob" design that was introduced on KitKat. The underlying architecture of Android was revised so that low-level, vendor-specific code for supporting a device's hardware can be separated from the Android OS framework using a hardware abstraction layer known as the "vendor interface". Vendor interfaces must be made forward compatible with future versions of Android; this theoretically allows the quicker development and deployment of Android updates for devices, as vendors would only need to make the necessary modifications to their bundled software. All devices shipping with Oreo must support a vendor interface, but this feature is optional for devices being updated to Oreo from an earlier version. The "seamless updates" system introduced in Android 7.0 was also modified to download update files directly to the system partition, rather than requiring them to be downloaded to the user partition first. This reduces storage space requirements for system updates. Android Oreo introduces a new automatic repair system known as "Rescue Party"; if the operating system detects that core system components are persistently crashing during startup, it will automatically perform a series of escalating repair steps. If all automatic repair steps are exhausted, the device will reboot into recovery mode and offer to perform a factory reset. The Android 8.1 update also introduces a neural network API, which is designed to "[provide] apps with hardware acceleration for on-device machine learning operations." This API is designed for use with machine learning platforms such as TensorFlow Lite, and specialized co-processors such as the Pixel Visual Core (featured in Google's Pixel 2 smartphones, but dormant until 8.1 is installed), but it also provides a CPU fallback mode.

C. Android Go

A tailored distribution for low-end devices known as Android Go was unveiled for Oreo; it is intended for devices with 1 GB of RAM or less. This mode has platform optimizations designed to reduce mobile data usage (including enabling Data Saver mode by default), and a special suite of Google Mobile Services designed to be less resource- and bandwidth-intensive. The Google Play Store will also

highlight lightweight apps suited for these devices. The operating system's interface is also modified, with the quick settings panel providing greater prominence to information regarding the battery, mobile data limit, and available storage, the recent apps menu using a modified layout and being limited to four apps (in order to reduce RAM consumption), and an API for allowing mobile carriers to implement data tracking and top-ups within the Android settings menu. Google Play Services was also modularized to reduce its memory footprint. Android Go was made available to OEMs for Android 8.1.

D. Security

Android Oreo re-brands automatic scanning of Google Play Store and sideloaded apps as "Google Play Protect", and gives the feature, as well as Find My Device (formerly Android Device Manager) higher prominence in the Security menu of the Settings app. As opposed to a single, system-wide setting for enabling the installation of apps from sources outside of the Google Play Store, this function is now implemented as a permission that can be granted to individual apps (i.e. clients for third-party app repositories such as Amazon Appstore and F-Droid). Verified boot now includes a "Rollback Protection" feature, which enforces a restriction on rolling back the device to a previous version of Android, aimed at avoiding a potential thief from bypassing security measures by installing a previous version of the operating system that doesn't have them in place.

CONCLUSION

In this paper, explains about the android versions and also some details about previous android versions and mainly this research about the latest version of android that is android 7.0 Nougat and also about its features and details about its release. Android Nougat is that version of android developed by Google which recovers the all drawbacks of marshmallow and also it contains extended features. It also explains about the next coming feature which is already part of the Android smartphone market i.e Android Version Oreo including the next level of its extended features compared to other or previous android versions. So the Nougut-successor Oreo is the brand new version of Android world.

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