

# Android N - The Latest version of Android 7.0

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## ABSTRACT

Android N (Nougat) that is Android 7.0 the 15th version of Android released on 22 August 2016 with Nexus devices being the first to receive and update . Android 7.0 Nougat introduces a variety of new features and capabilities for users and developers. One of the most prominent changes in the Android Nougat is a split-screen (Multi window support) 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. Other feature was the notification shade was redesigned, featuring a smaller row of icons for settings, replacing notification cards with a sort of "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. Android N is a drastically changes operating system to its predecessors.

**Keywords:** Android 7.0, Nougat, Android N, Google, Doze, Vulkan, Emojis

## I. INTRODUCTION

Android 7.0 "Nougat" is the 7th major version of the Android operating system. On March 9, 2016, ahead of the Google I/O developer conference, Google released the first beta of Android "N" as part of a new "Android Beta Program" intended for testing by developers and enthusiasts before official release. The developer preview builds were compatible with only current Google Nexus devices; the 5X, 6P, 6, 9, Pixel C, and Nexus Player. The "Android Beta Program" that was introduced allows testers to opt-in for over-the-air updates to new beta versions as they are released. On April 13, 2016, Android N Beta Preview 2 was released. Google further discussed Android "N" during the I/O keynote on May 18, 2016, and unveiled its new virtual reality platform Daydream. During the conference, Beta Preview 3 was released, along with Google stating it has now gone from developer-beta to public-beta, which means anyone can try it out. Google also announced that it would hold a contest to determine the official release name of the operating system. Beta Preview 4 was released on June 15, 2016. On June 30, 2016, Google

announced that N's release name would be "Nougat"; it was also confirmed that Nougat would be version 7.0 of Android. The final Beta Preview, 5, was released on July 18, 2016. Android 7.0 Nougat was officially released on August 22, 2016, with the Nexus 6, Nexus 5X, Nexus 6P, Nexus 9, Nexus Player, Pixel C and General Mobile 4G as the first devices to receive the update. Going forward, updates to Nougat will be released quarterly as maintenance releases focusing on "continued refinements and polish", with the next developer preview coming in the fall of 2016.

## II. METHODS AND MATERIAL

### 1. Development

In December 2015, Google announced that Android Nougat would switch its JRE (Java Runtime Environment) from the defunct Apache Harmony to OpenJDK—the official open source implementation of the Java platform maintained by Oracle Corporation and the Java community.[19] The Android Runtime (ART) now incorporates a profile-guided compilation system,

utilizing a JIT compiler and profiling alongside its current ahead-of-time compiler to further optimize apps for a device's hardware and other conditions in the background.

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. Developer Preview 2 added platform support for Vulkan, the new low-level 3D rendering API to augment OpenGL ES but with higher graphics performance. Support for the Daydream VR platform is introduced in Nougat. Features include a "VR mode" for reduced graphics latency, a "sustained performance mode" to assist developers in optimizing apps to a device's 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. Nougat is the first version featuring Unicode 9.0 support and comes with updated emoji plus support for emoji skin tones.

## 2. Features

### a) *Multi-window Support*

In Android 7.0, Google introduced a new and much-requested multitasking feature into the platform that is "multi-window support". Users can now pop open two apps on the screen at once. On phones and tablets running Android 7.0, users can run two apps side-by-

side or one-above-the-other in split screen mode. Users can resize the apps by dragging the divider between them. On Android TV devices, apps can put themselves in picture-in-picture mode, allowing them to continue showing content while the user browses or interacts with other apps.

Especially on tablets and other larger-screen devices, multi-window support gives you new ways to engage users. You can even enable drag-and-drop in your app to let users conveniently drag content to or from your app — a great way to enhance your user experience. It's straightforward to add multi-window support to your app and configure how it handles multi-window display. For example, you can specify your activity's minimum allowable dimensions, preventing users from resizing the activity below that size. You can also disable multi-window display for your app, which ensures that the system will only show your app in full-screen mode.

### b) *Notification Enhancements*

In Android 7.0 Google has redesigned notifications to make them easier and faster to use. Some of the changes include:

- **Template updates:** Google updating notification templates to put a new emphasis on hero image and avatar. Developers will be able to take advantage of the new templates with minimal adjustments in their code.
- **Messaging style customization:** You can customize more of the user interface labels associated with your notifications using the Messaging Style class. You can configure the message, conversation title, and content view.
- **Bundled notifications:** The system can group messages together, for example by message topic, and display the group. A user can take actions, such as Dismiss or Archive, on them in place. If you've implemented notifications for Android Wear, you'll already be familiar with this model.
- **Direct reply:** For real-time communication apps, the Android system supports inline replies so that users can quickly respond to an SMS or text message directly within the notification interface.
- **Custom views:** Two new APIs enable you to leverage system decorations, such as notification headers and actions, when using custom views in notifications.

### c) *JIT/AOT Compilation*

In Android 7.0, Google has added a Just in Time (JIT) compiler with code profiling to ART, which lets it constantly improve the performance of Android apps as they run. The JIT compiler complements ART's current Ahead of Time (AOT) compiler and helps improve runtime performance, save storage space, and speed up app updates and system updates.

Profile-guided compilation lets ART manage the AOT/JIT compilation for each app according to its actual usage, as well as conditions on the device. For example, ART maintains a profile of each app's hot methods and can precompile and cache those methods for best performance. It leaves other parts of the app uncompiled until they are actually used.

Besides improving performance for key parts of the app, profile-guided compilation helps reduce an app's overall RAM footprint, including associated binaries. This feature is especially important on low-memory devices.

ART manages profile-guided compilation in a way that minimizes impact on the device battery. It does pre compilation only when then the device is idle and charging, saving ime and battery by doing that work in advance.

### d) *Data Saver*

Android 7.0 introduces Data Saver mode, a new system service that helps reduce cellular data use by apps, whether roaming, near the end of the billing cycle, or on a small prepaid data pack. Data Saver gives users control over how apps use cellular data and lets developers provide more efficient service when Data Saver is on.

When a user enables Data Saver in Settings and the device is on a metered network, the system blocks background data usage and signals apps to use less data in the foreground wherever possible — such as by limiting bit rate for streaming, reducing image quality, deferring optimistic pre caching, and so on. Users can whitelist specific apps to allow background metered data usage even when Data Saver is turned on.

Android 7.0 extends the ConnectivityManager to provide apps a way to retrieve the user's Data Saver

preferences and monitor preference changes. All apps should check whether the user has enabled Data Saver and make an effort to limit foreground and background data usage.

### e) *Vulkan API*

Android 7.0 integrates Vulkan, a new 3D rendering API, into the platform. Like OpenGL™ ES, Vulkan is an open standard for 3D graphics and rendering maintained by the Khronos Group.

Vulkan is designed from the ground up to minimize CPU overhead in the driver, and allow your application to control GPU operation more directly. Vulkan also enables better parallelization by allowing multiple threads to perform work such as command buffer construction at once.

### f) *Quick Settings Tile API*

Quick Settings is a popular and simple way to expose key settings and actions, directly from the notification shade. In Android 7.0, Google expanded the scope of Quick Settings to make it even more useful and convenient.

Google added more room for additional Quick Settings tiles, which users can access across a paginated display area by swiping left or right. Google also given users control over what Quick Settings tiles appear and where they are displayed — users can add or move tiles just by dragging and dropping them.

For developers, Android 7.0 also adds a new API that lets you define your own Quick Settings tiles to give users easy access to key controls and actions in your app.

Quick Settings tiles are reserved for controls or actions that are either urgently required or frequently used, and should not be used as shortcuts to launching an app.

### g) *Number Blocking*

Android 7.0 now supports number blocking in the platform and provides a framework API to let service providers maintain a blocked-number list. The default SMS app, the default phone app, and carrier apps can read from and write to the blocked-number list. The list is not accessible to other apps.

By making number blocking a standard feature of the platform, Android provides a consistent way for apps to support number blocking across a wide range of devices.

#### **h) Call Screening**

Android 7.0 allows the default phone app to screen incoming calls. The phone app does this by implementing the new CallScreeningService, which allows the phone app to perform a number of actions based on an incoming call's Call.Details, such as:

#### **i) Multi-locale Support, More Languages**

Android 7.0 now lets users select multiple locales in Settings, to better support bilingual use-cases. Apps can use a new API to get the user's selected locales and then offer more sophisticated user experiences for multi-locale users such as showing search results in multiple languages and not offering to translate webpages in a language the user already knows.

Along with multi-locale support, Android 7.0 also expands the range of languages available to users. It offers more than 25 variants each for commonly used languages such as English, Spanish, French, and Arabic. It also adds partial support for more than 100 new languages.

#### **j) New Emojis**

Android 7.0 introduces additional emojis and emoji-related features including skin tone emojis and support for variation selectors. If your app supports emojis, follow the guidelines below to take advantage of these emoji-related features.

Check that an emoji supports skin tone. Android 7.0 allows users to modify the rendered skin tone of emojis to their preference. Keyboard apps should provide visual indications for emojis that have multiple skin tones and should allow users to select the skin tone that they prefer.

#### **k) Network Security Config**

In Android 7.0, apps can customize the behavior of their secure (HTTPS, TLS) connections safely, without any code modification, by using the declarative Network Security Config instead of using the conventional error-

prone programmatic APIs (e.g. X509TrustManager).

#### **l) APK Signature Scheme v2**

Android 7.0 introduces APK Signature Scheme v2, a new app-signing scheme that offers faster app install times and more protection against unauthorized alterations to APK files. By default, Android Studio 2.2 and the Android Plugin for Gradle 2.2 sign your app using both APK Signature Scheme v2 and the traditional signing scheme, which uses JAR signing.

### **III. CONCLUSION**

Android has come a long way and Nougat definitely improves on what has been accomplished so far. All the new features and functionalities it introduces are definitely rather important ones and we can't say that any of these is an unnecessary overkill or an overcomplication. Additionally, we are definitely digging that improved notifications system, which feels like the best part of Android Nougat. Performance is, so far, also great. So are the numerous added security features, little customization tweaks thrown in the interface. All in all, Android Nougat(Android V 7.0) is an excellent release.

### **IV. REFERENCES**

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