

DEVTALK:

What's New for Android Pie and the impact
on Zebra developers







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What's new for Zebra Developers in Android Pie

Trends over time

						
Running in the background	Job Scheduler	Doze mode	Doze “on the go”	Background restrictions	Machine learning for intelligent restrictions	Restricted access to location in the background
Notifications	Quick settings & notification shade	Long press to access options	Direct reply & bundled notifications	Notification channels & snooze	Enhanced messaging experience	Notification bubbles (native support)
One or Two other major changes affecting Enterprise	Material design	Runtime permissions	Multi-window	Changes to the Google Play Store policies	Non-SDK methods actively discouraged	External storage changes
Android Enterprise features	Android for Work, app restrictions	DO mode, lock task mode, managed configs	DPM API enhancements	DPM API enhancements	DPM API enhancements	Full transition to DO mode

What's new for Zebra Developers in Android Pie

Overview

- Google publish documentation in each new release
 - [Lollipop](#), [Marshmallow](#), [Nougat](#), [Oreo](#), [Pie](#), [Android 10](#)
 - Includes samples, behaviour changes, API changes & other pertinent info
 - Blogs such as [this one](#) on background execution
 - Android Enterprise changes for:
 - [Nougat](#), [Oreo](#), [Pie](#). Mostly aimed at EM partners but good to understand Android capabilities
- Zebra publish documentation in each new release
 - [Marshmallow](#), [Nougat](#), [Oreo](#), [Pie](#)
 - Think of this as “Reading the Google documentation with an Enterprise mindset”
- Previous DEVTALKs discussing
 - Changes to [Marshmallow & Nougat](#)
 - Changes to [Oreo](#)

What's new for Zebra Developers in Android Pie

Google's highlighted features

- Notification updates and smart reply
- Data cost sensitivity in JobScheduler
- Multi-camera APIs
- ImageDecoder for bitmaps and drawables
- Display cutout APIs
- More...

What's new for Zebra Developers in Android Pie

Power Management changes: App standby buckets & adaptive battery

- Enhancement to the existing '[App Standby](#)' feature first introduced in Marshmallow
- Behaviour of the application will change depending on how the Operating System categorizes that app. Apps are categorized into buckets
- An application may change buckets
 - No API exists to request the app be in a particular bucket
 - No API exists to determine when the app changes buckets
 - An API does exist to obtain a snapshot of which bucket the app is in
- Best advice is to work with the bucket-based restrictions rather than trying to influence them
- [Official documentation](#) for bucket based restrictions is available.

What's new for Zebra Developers in Android Pie

Power Management changes: App standby buckets & adaptive battery

Bucket	Description
Active	User is currently engaged with the application and Android considers it to be in the foreground Restrictions: none
Working set	Application is not currently active but runs often. Restrictions: Jobs and Alarms will be deferred. No restrictions on network access or Firebase Cloud Messaging .
Frequent	Application is used regularly but not necessarily every day. Restrictions: Jobs and Alarms will be deferred for longer than applications in the working set. No restrictions on network access but Firebase Cloud Messaging is limited to 10 high priority messages a day.
Rare	Application is not often used. Restrictions: Jobs and Alarms will be deferred for longer than applications in the frequent set. Network access is deferred and Firebase Cloud Messaging is limited to 5 high priority messages a day.
Never	Application has been installed but never run. “The system imposes severe restrictions on these apps.”

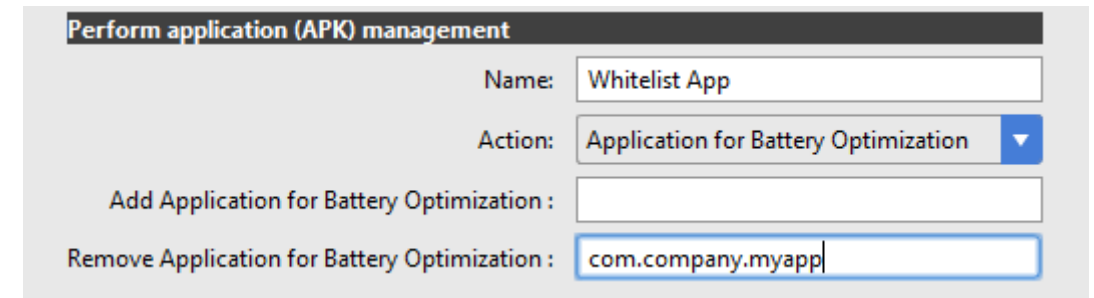
What's new for Zebra Developers in Android Pie

Power Management changes: App standby buckets & adaptive battery

Applications which are on the doze whitelist are exempted from bucket-based restrictions

- Zebra have a couple of administrator features to whitelist an application:

- Whitelist a particular app with the [App Manager](#)



Perform application (APK) management

Name:

Action:

Add Application for Battery Optimization :

Remove Application for Battery Optimization :

- Disable Doze Mode entirely on the device with the [Power Manager](#)

Enable/Disable Doze Mode: ?

Do not change

Enable

Disable

Remember: Whitelisting an app may increase your device battery consumption

What's new for Zebra Developers in Android Pie

Power Management changes: App standby buckets & adaptive battery

- Testing: ADB commands exist for controlling and checking an app bucket

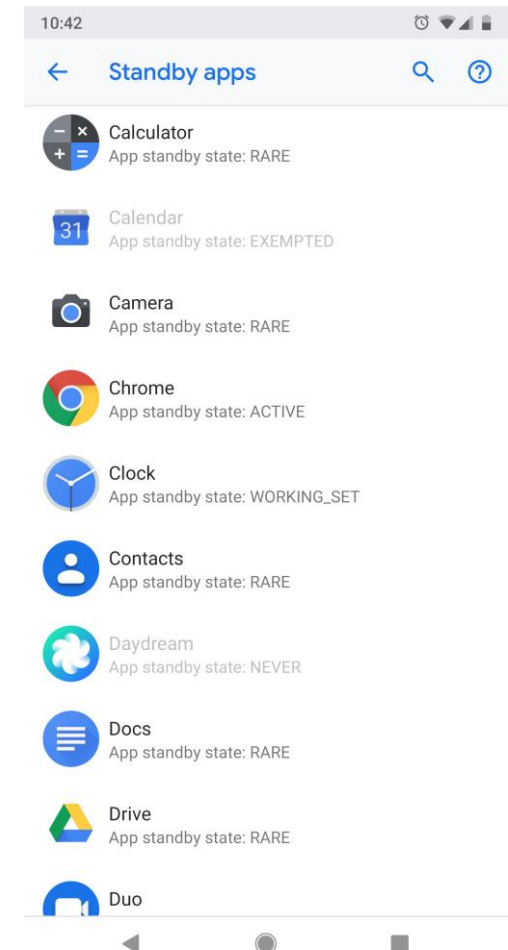
Manually assign an app to a bucket

```
$ adb shell am set-standby-bucket packagename active |  
working_set | frequent | rare
```

Check what bucket an app is in

```
$ adb shell am get-standby-bucket packagename
```

- You can see the bucket for every app from 'Standby apps' configuration under 'Developer Options' (Right)



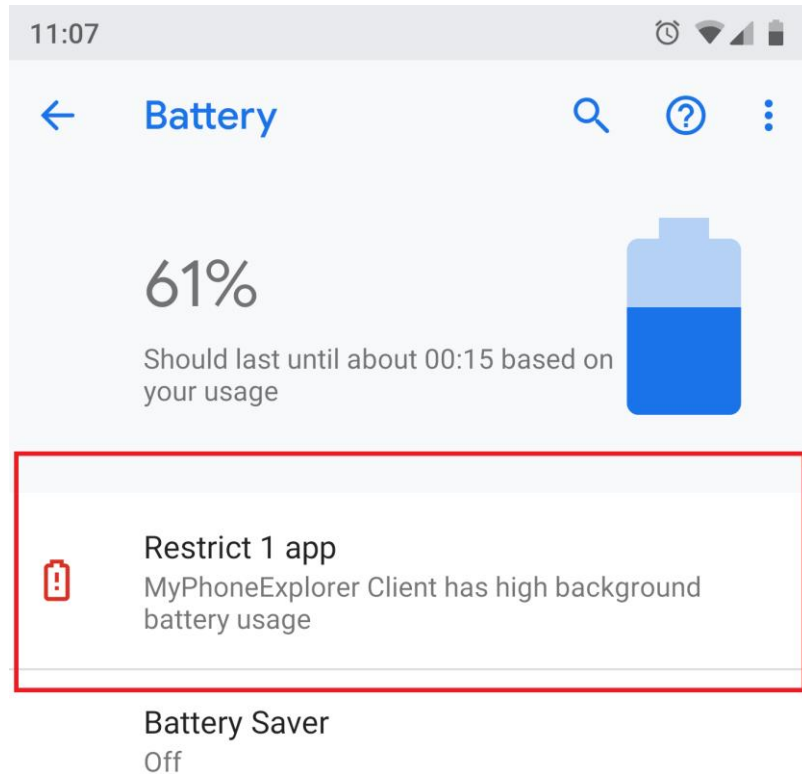
What's new for Zebra Developers in Android Pie

Power Management changes: App restrictions

- The user can put an application into the 'restricted' state
- Until the app comes to the foreground a restricted app will have the following restrictions:
 - [Jobs](#) or [Alarms](#) will not fire
 - The app will have no access to the network or device location
 - The app will not be able to receive [Firebase Cloud Messages](#) regardless of their priority
- This is an evolution of Oreo's background limits, but stricter
 - E.g. on Oreo, background apps can still receive Firebase Cloud Messages

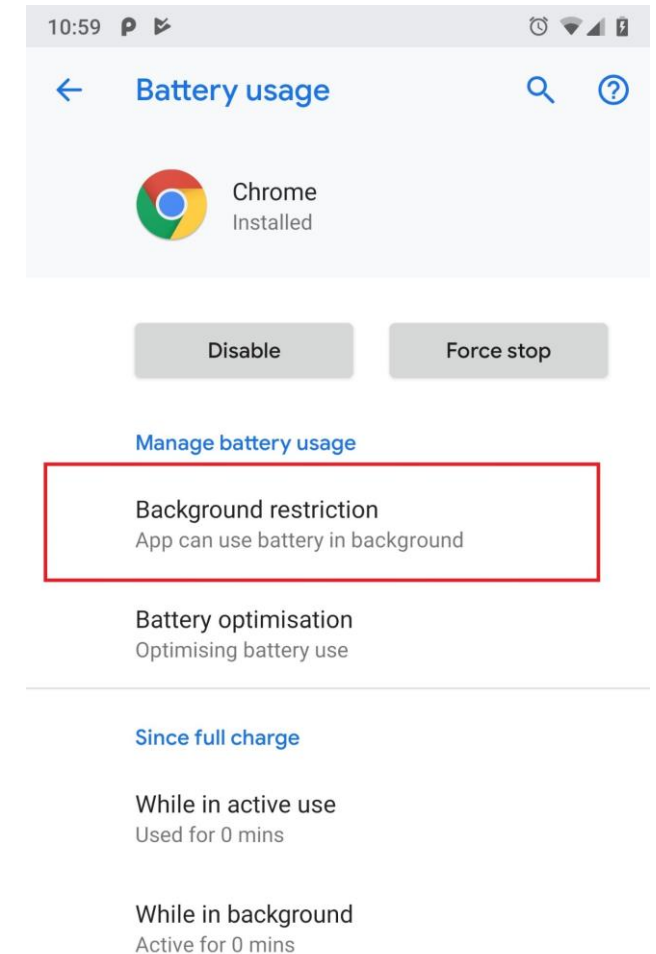
What's new for Zebra Developers in Android Pie

Power Management changes: App restrictions



Apps are restricted **by the user**, either by:

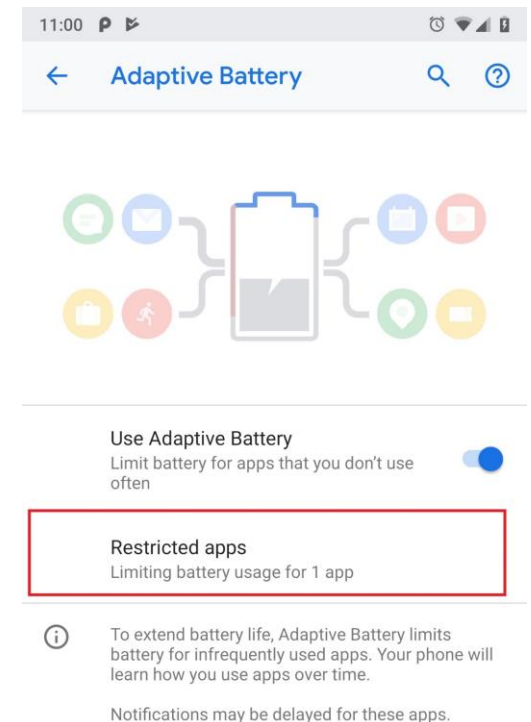
- From the **automatically generated** list on the “Battery” Settings UI (Settings → Battery), Left.
 - Criteria for this determination is subject to change.
- From the “Battery usage” Settings UI (Apps & notifications → App → Advanced → Battery → Background restriction), Right.



What's new for Zebra Developers in Android Pie

Power Management changes: App restrictions

- You can view which apps are restricted from the Adaptive Battery Screen:
 - Settings → Battery → Adaptive Battery → Restricted apps
- There is no API to determine if your app is restricted or to control whether or not it should be restricted
 - Again, Google advises to work with the restriction rather than counteract it.



What's new for Zebra Developers in Android Pie

Power Management changes: App restrictions

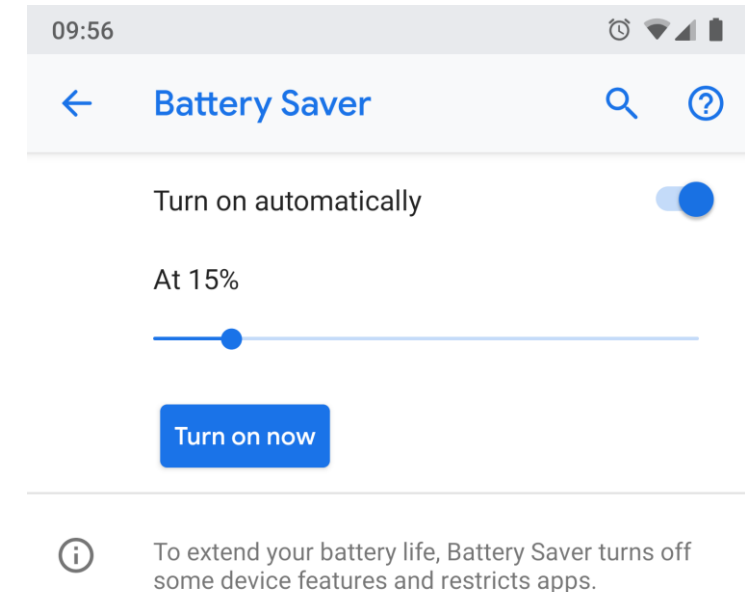
Most enterprises will want their line of business applications to **never be restricted**:

- Best practice (even before app restrictions) is to **limit the settings available to the end user**, e.g.:
 - Zebra's own [Enterprise Home Screen](#) application can reduce the available settings
 - Restricting access to device settings has been a feature of Zebra's [MX Access Manager](#) for a long time now
 - If you are using an EMM, they will almost certainly offer the ability to lock down the device settings from the end user.
 - You could use the kiosk features which are part of Android Enterprise for task specific devices

What's new for Zebra Developers in Android Pie

Power Management changes: Battery saver improvements

- Battery saver is similar to application restrictions but applies restrictions to all applications on the device.
- When battery saver is turned on the device will take several steps to reduce battery consumption for example stopping all applications from performing background work ([official documentation](#)).
- Battery saver is not a new feature in Pie but it has been modified:
- Although disabled out of the box, battery saver can either be turned on manually by the user or be configured to turn on automatically at some specified battery percentage, by default 15%.
- Restrict access to the Settings screen to prevent your users enabling Battery Saver mode



What's new for Zebra Developers in Android Pie

Power Management changes: Battery saver improvements

Battery saver	Oreo	Pie
Out of box state	Off and battery saver will not automatically enable	Off and battery saver will not automatically enable
How to manually enable	Either from the Battery Saver menu (Settings → Battery → Battery Saver) or from the Quick Settings icon	Either from the Battery Saver menu (Settings → Battery → Battery Saver) or from the Quick Settings icon
Supported 'turn on automatically at X%'	Supports either 10% battery or 18% battery	Configurable anywhere between 5% and 75%
How to turn off battery saver	Either manually from the Battery Saver menu / Quick Settings icon or by providing power to the device	Manually from the Battery saver menu / Quick Settings icon. In contrast with Oreo, providing power to the device will only disable battery saver whilst that power is applied.

What's new for Zebra Developers in Android Pie

Power Management changes: Summary

- Google have given more **user control** over how applications use battery
- In general, Enterprises want to limit what the user can do rather than give more control.
- Most customers already use some form of lock-down over the device settings
- Zebra offer full configurability over the device doze mode (which affects App Standby Buckets)
- Actual impact to your deployment may be minimal but worth understanding what changes have been made.

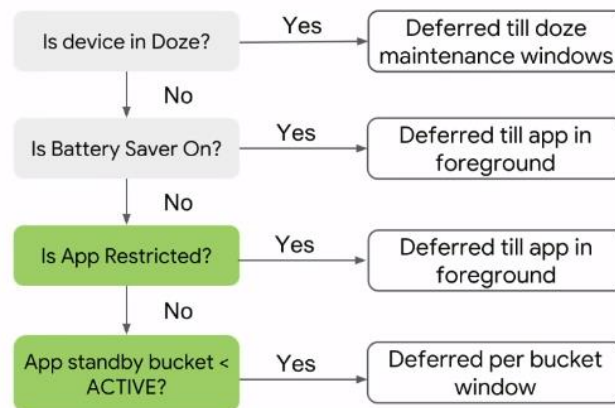
What's new for Zebra Developers in Android Pie

Power Management changes: Summary

- For an alternative summary, I would recommend Google's Android DevSummit presentation from November 2018: <https://www.youtube.com/watch?v=-7eZL3XRqas>
- Gives a good overview of Alarms, Jobs and FCM and how they are affected by the Power changes in Pie
 - Screenshots from that talk below:

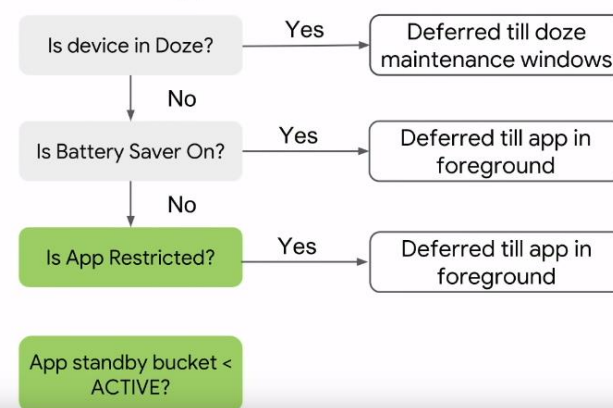
AlarmManager Alarms

When will my alarm fire?



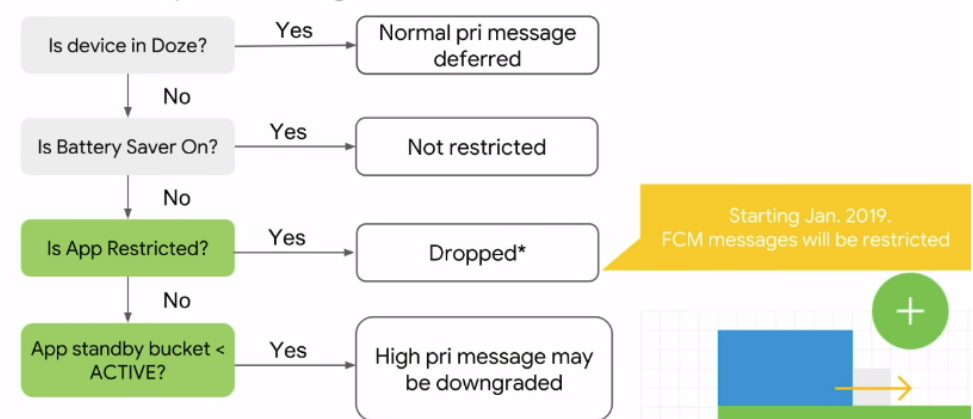
Running scheduled jobs

When will my job run?



Firebase Cloud Messaging

When will my FCM messages be delivered?



Starting Jan. 2019, FCM messages will be restricted



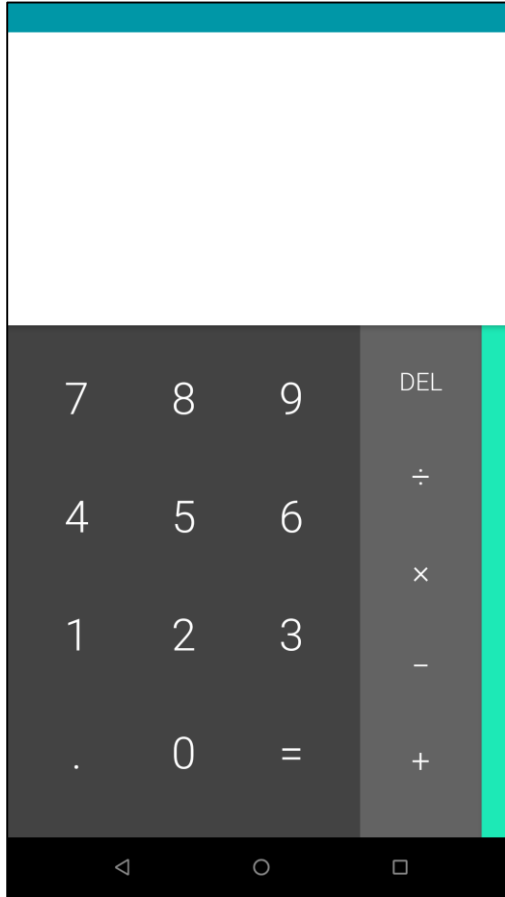
What's new for Zebra Developers in Android Pie

Lock down enhancements

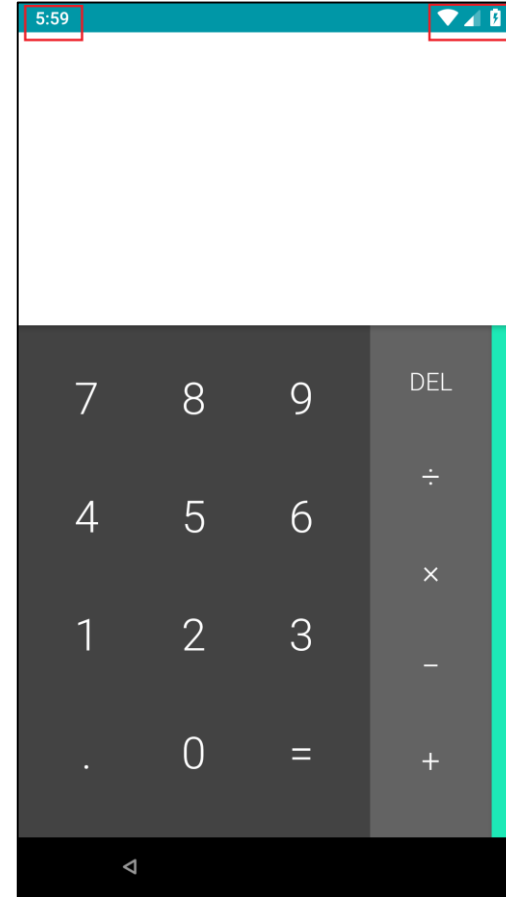
- Lock Task Mode is Android Enterprise's Kiosk Mode
- Callable from a DO (or PO), so aimed primarily at EMMs. Application developers need to be aware that they could be running in Lock Task Mode
- In Marshmallow, Nougat and Oreo:
 - The ***application developer*** had to request that lock task mode be set
- In Pie and newer:
 - The DO (EMM) can put any application into lock task mode
- Impact to developers:
 - You may find yourself in lock task mode unexpectedly
 - You may need to communicate your dependencies to the administrator
- New Flags have been introduced in P to control what 'Lock Task Mode' looks like

What's new for Zebra Developers in Android Pie

Lock down enhancements: Flags



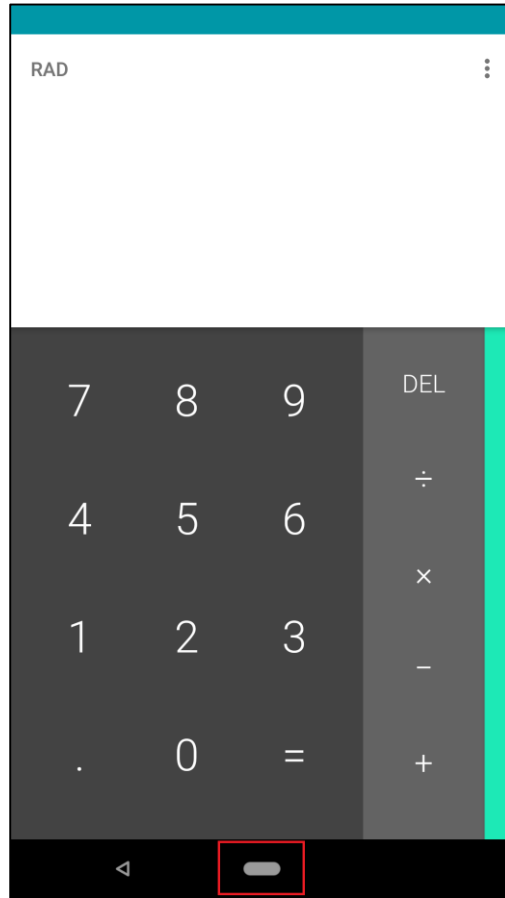
LOCK TASK FEATURE NONE



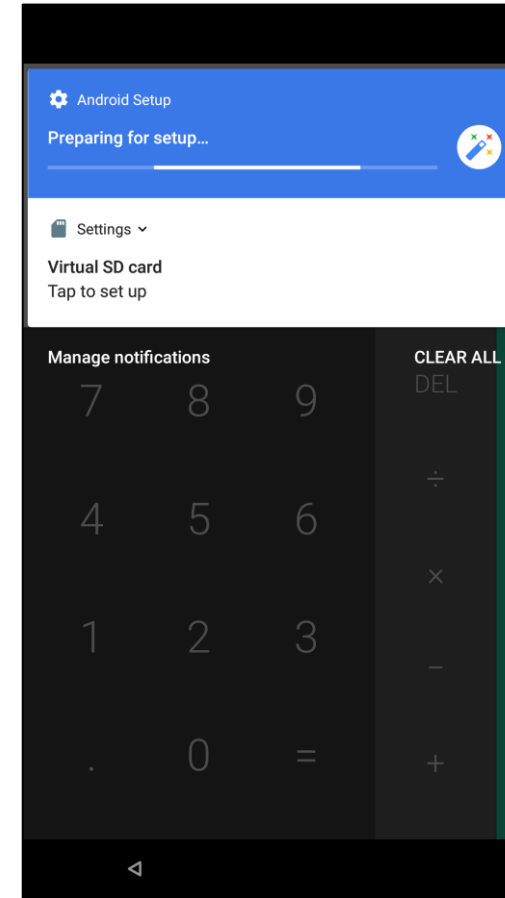
LOCK TASK FEATURE SYSTEM INFO

What's new for Zebra Developers in Android Pie

Lock down enhancements: Flags



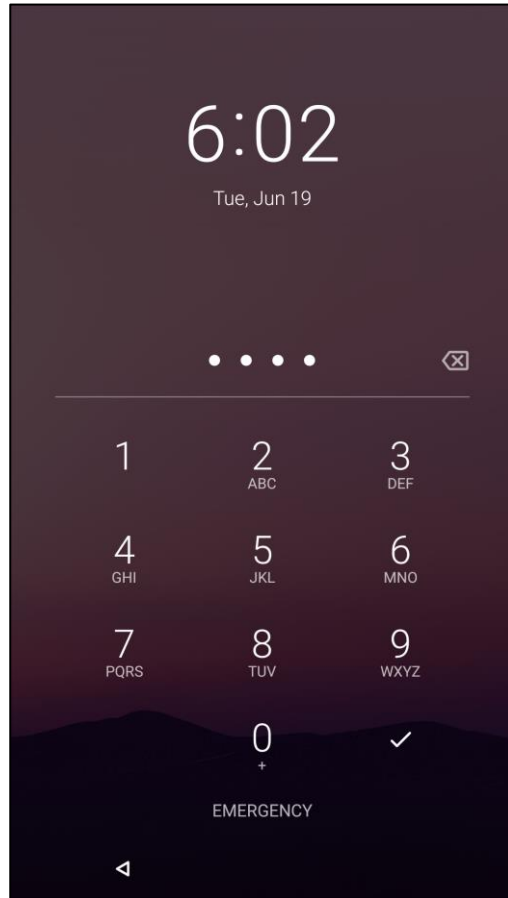
[LOCK TASK FEATURE HOME](#)



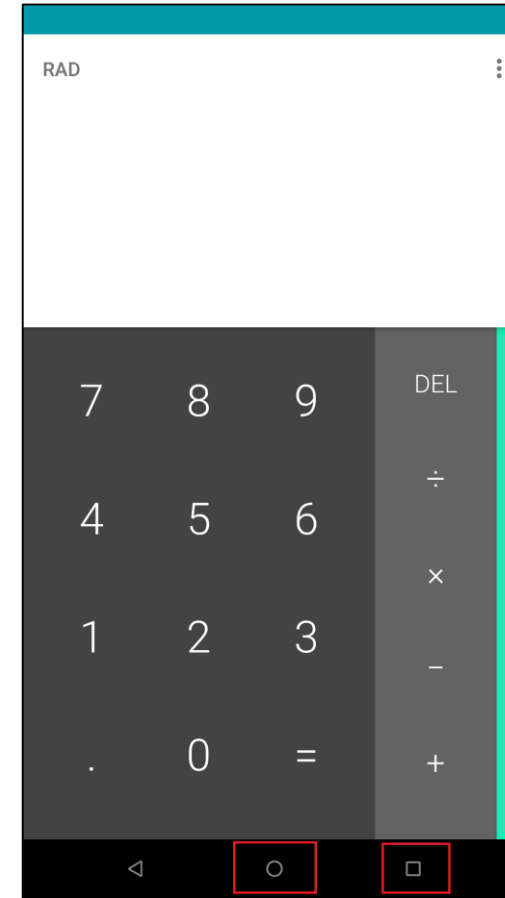
[LOCK TASK FEATURE NOTIFICATIONS](#)

What's new for Zebra Developers in Android Pie

Lock down enhancements: Flags



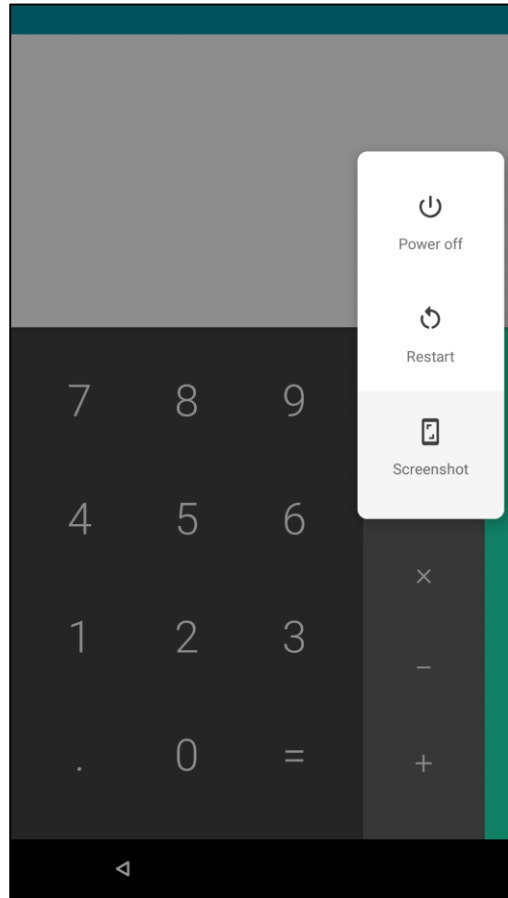
[LOCK TASK FEATURE KEYGUARD](#)



[LOCK TASK FEATURE OVERVIEW](#)

What's new for Zebra Developers in Android Pie

Lock down enhancements: Flags



[LOCK TASK FEATURE GLOBAL ACTIONS](#)

What's new for Zebra Developers in Android Pie

Lock down enhancements: Flags

- There is significant overlap between the current capabilities of Zebra's MX and the new Pie Lock Task mode flags – customers with mixed deployments may wish to use MX until their device fleet has fully transitioned to Pie (1/2):
 - The UI Manager's [Recent App Button Enable / Disable](#) is analogous to the LOCK_TASK_FEATURE_OVERVIEW flag, though the latter flag requires that the home button also be shown.
 - The UI Manager's [Home Key Enable / Disable](#) is analogous to the LOCK_TASK_FEATURE_HOME flag.
 - The UI Manager's [Notification Pulldown Enable / Disable](#) feature has the same functionality as the LOCK_TASK_FEATURE_NOTIFICATIONS flag though Zebra offer more granular configuration of the [Quick Settings menu](#).

What's new for Zebra Developers in Android Pie

Lock down enhancements: Flags

- There is significant overlap between the current capabilities of Zebra's MX and the new Pie Lock Task mode flags – customers with mixed deployments may wish to use MX until their device fleet has fully transitioned to Pie: (2/2)
 - The PowerKey Manager's [Touch Panel Show / Hide](#) feature overlaps with the LOCK_TASK_FEATURE_GLOBAL_ACTIONS flag.
 - The PowerKey Manager's [Automatic Screen Lock Enable Disable](#) feature overlaps with the LOCK_TASK_FEATURE_KEYGUARD flag.
 - The UI Manager's [Navigation Bar Enable / Disable](#) can enable or disable the entire row of controls (back, home and recent). This has no corresponding flag as it also disables the back button but falls under the same category of features.

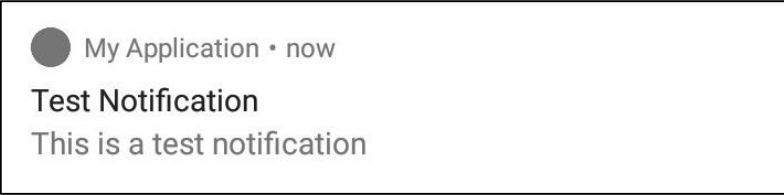
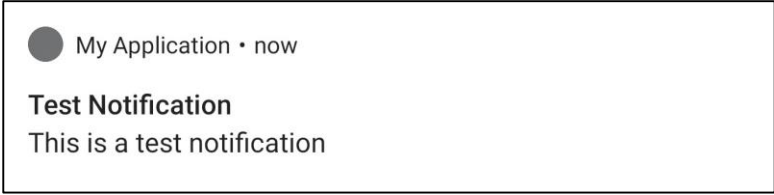
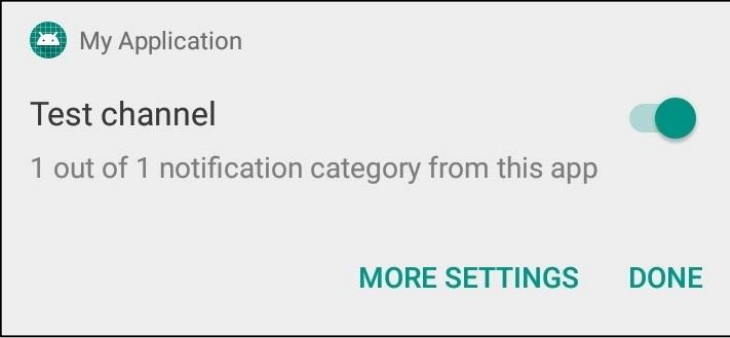
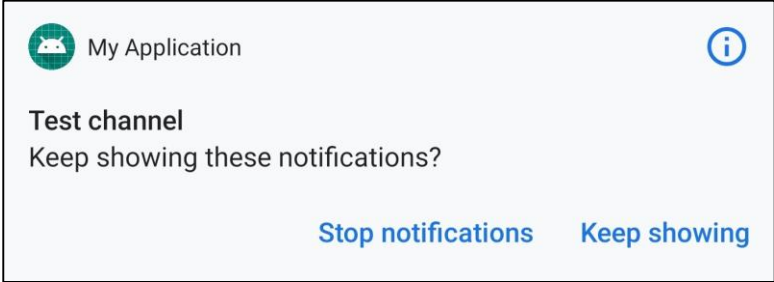
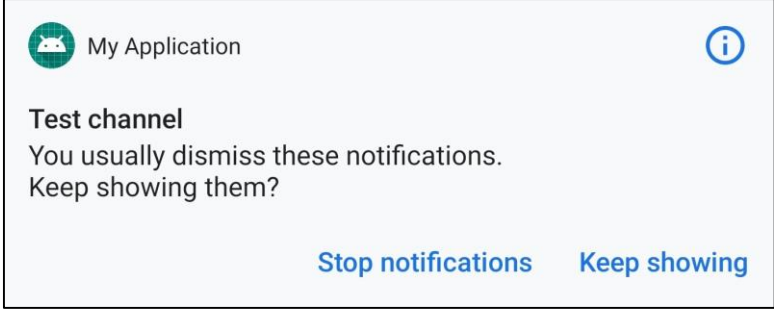
What's new for Zebra Developers in Android Pie

Ephemeral Users

- Extension to Android's multi-user capability and are implemented as secondary users
- Deleted when the user logs out (stops) or switches away
- Ephemeral users are one piece in an overall solution
 - Primary / secondary user creation is controlled by the DO (or PO), i.e. the EMM
- Use cases are around shared devices where a worker will take a device out of a rack and that device is ready to go.
 - Does not specifically require user log-in / log-out but that could be accomplished via the EMM
- Want feedback. Does this meet your shared device use cases?
- Zebra Pie devices are / will be compatible with Ephemeral users, where supported by the EMM

What's new for Zebra Developers in Android Pie

Notification enhancements

Notification	Oreo	Pie
Standard notification	 A standard notification card with a grey header bar. It contains a grey circle icon, the text "My Application • now", "Test Notification", and "This is a test notification".	 A standard notification card with a grey header bar. It contains a grey circle icon, the text "My Application • now", "Test Notification", and "This is a test notification".
Long press the notification	 A notification card with a grey background. It has a green header bar with a robot icon and "My Application". Below is "Test channel" and "1 out of 1 notification category from this app" with a green toggle switch. At the bottom are "MORE SETTINGS" and "DONE" in green.	 A notification card with a light blue background. It has a green header bar with a robot icon and "My Application". Below is "Test channel" and "Keep showing these notifications?". At the bottom are "Stop notifications" and "Keep showing" in blue. An info icon is in the top right.
After repeatedly dismissing the notification	No change in behaviour	 A notification card with a light blue background. It has a green header bar with a robot icon and "My Application". Below is "Test channel" and "You usually dismiss these notifications. Keep showing them?". At the bottom are "Stop notifications" and "Keep showing" in blue. An info icon is in the top right.

What's new for Zebra Developers in Android Pie

Notification enhancements

- Recommendations for Enterprise apps
 - Continue to enable the Settings Manager's [App Notification Control option](#) to prevent the user from accessing the application settings
 - Look out for additional MX features to ensure notifications can be fully locked down under Pie
 - Optionally: make your notifications [persistent](#) to avoid them being dismissed by the user

What's new for Zebra Developers in Android Pie

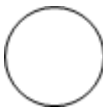



Privacy

- Applications are not able to use the following in the background: Device sensors (accelerometers / gyroscopes) & the microphone
 - Google recommend using a [foreground service](#) as a workaround
- Some of the permissions have changed around accessing phone numbers and call logs.
 - Likely a low impact in the Enterprise where dedicated communication tools such as Zebra's [Workforce connect](#) are more prevalent.
- Performing a Wi-Fi scan of nearby Aps requires additional application permissions.
- Build.SERIAL now returns “UNKNOWN”
 - Developers need to use [Build.getSerial\(\)](#) which requires the READ_PHONE_STATE permission
 - Continuing trend to restrict an application from uniquely identifying a device

What's new for Zebra Developers in Android Pie

Restrictions on non-SDK interfaces

- Google have produced an [entire documentation subpage](#) describing the restrictions being imposed on applications calling non-SDK methods via reflection or via JNI. Please consult that documentation for information on how to determine which APIs your application is using, details of the errors thrown and additional technical information about the different SDK lists.

<div>Whitelist</div> <div></div> <ul style="list-style-type: none">• Interface is part of the Android SDK• No restrictions on use	<div>Blacklist</div> <div></div> <ul style="list-style-type: none">• Interface can only be called by Platform apps• Will throw an error when invoked
<div>Light Greylist</div> <div></div> <ul style="list-style-type: none">• No public alternative exists for this API• Warning will be generated if target SDK $\geq P$• API will continue to function	<div>Dark Greylist</div> <div></div> <ul style="list-style-type: none">• Warnings will be generated if the target SDK $< P$• Will throw an error when invoked if the target SDK $\geq P$

What's new for Zebra Developers in Android Pie

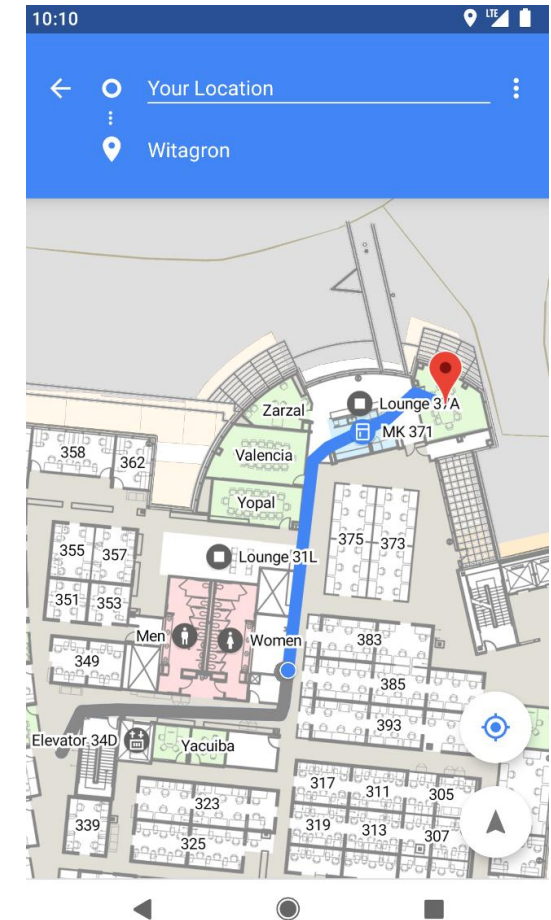
Restrictions on non-SDK interfaces

- Although OEMs can *add* interfaces to these lists, Zebra have no current plans to do so.
 - OEMs cannot *remove* interfaces from these lists (& still be CTS compliant!)
- Action for Enterprise developers targeting Pie devices:
 - Consult the Google documentation for '[testing for non-SDK interfaces](#)'
 - Run your application on a Pie device or emulator (where possible) and observe any log messages or runtime errors because of blacklisted or dark greylisted applications
 - Run the [veridex](#) static analysis tool on your apk to detect calls to non-SDK methods via reflection.
 - Modify your application so it is not making any calls to the Blacklisted or dark greylisted APIs
 - Monitor use of APIs on the light greylist and transition when possible.

What's new for Zebra Developers in Android Pie

Indoor positioning with Wi-Fi RTT

- Like any indoor positioning technology this requires:
 - Some level of infrastructure, in this case Wi-Fi APs that support 802.11mc
 - Device hardware support (*Zebra hardware support is pending*)
 - A server component and indoor maps to interpret the raw position into a mappable location.
- Zebra has several indoor location solutions for multiple use cases and deployment sizes:
 - Support for Visible Light Communication (VLC) in our latest mobile devices ([press release](#)).
 - [Dart UWB](#) and [WhereNet](#), both of which use dedicated hardware tags and sensors
 - [Smartlens](#) for retail environments
 - [RFID](#) with a range of available readers and accessories for our Mobile Computer range.



What's new for Zebra Developers in Android Pie

Neural Networks

- Android Pie has updated the [Neural Networks API to version 1.1](#).
 - Note that this API is not yet supported on the SD660 chipset and Qualcomm has instead opted to include their own SDK for the “[Snapdragon Neural Processing Engine](#)”.
 - For more information on implementing machine learning on Zebra devices then please refer to the [2018 webinar on the subject](#) .
- You can also refer to the following [external article](#) for more information on the Snapdragon NPE, written by the aforementioned webinar's presenter, Zebra's Rafal Firlejczyk.

What's new for Zebra Developers in Android Pie

Changes to the Google Play Store

In 2018 Google introduced a requirement that applications being posted to the Play Store must target a recent Android API level. These requirements have been updated in 2019 and detailed in the associated [Android blog post](#), but the timeline is as follows:

- **August 2019:** New applications added to the Play store are required to target API level 28 (Android 9) or higher
- **November 2019:** Updates to existing applications are required to target API level 28 or higher.
- You can still assign any minimum SDK level since this restriction only affects the target SDK. [Google provide additional documentation](#) for developers who are updating their target SDK level.

What's new for Zebra Developers in Android Pie

Changes to the Google Play Store

- This will affect Enterprise applications:
 - Managed Android devices will typically use the Managed Play store which is subject to the same new rules.
 - Updating applications will require increasing the target SDK level and considering any restrictions introduced in the newly supported level(s)
 - Targeting a lower SDK level to circumvent Android restrictions will no longer work for applications hosted in the Play Store. This has been a popular technique with consumer apps to avoid Marshmallow [runtime permissions](#) and [Oreo background restrictions](#).
 - More robust workarounds are given in Zebra developer documentation.
- Existing applications that do not get updated will be allowed to stay in the Play store
- Application deployment that does not depend on the Play store may be affected (according to the [official Android blog](#)) – Zebra are working with Google on this.

What's new for Zebra Developers in Android Pie

Conclusions

- Android Pie has introduced many new features for application developers to take advantage of
- Android Enterprise continues to gain functionality and traction in the industry
- Pie continues Android's trend of giving more control to users whilst limiting what application developers can do in the background
 - This can be challenging to understand every nuance of the change but:
 - Google provide great classes like WorkManager which “just work” in the background (with caveats)
 - Zebra offer enterprise configuration to re-enable a number of use cases we are hearing from our customers
 - The end result will be extended battery life – **essential** for any Enterprise deployment.

What's new for Zebra Developers in Android Pie

Resources

- What's New for Android 'P' and the impact on Zebra Developers:
 - <https://developer.zebra.com/blog/what%E2%80%99s-new-android-pie-and-impact-zebra-developers>
- Google published documentation for each new release (samples, behaviour changes, API changes)
 - [Lollipop](#), [Marshmallow](#), [Nougat](#), [Oreo](#), [Pie](#), [Android 10](#)
- Google published documentation for new Android Enterprise features (primarily EMM focused)
 - [Nougat](#), [Oreo](#), [Pie](#)
- Recommended Google resources for specific Pie features:
 - [Android Enterprise talk on Power changes](#)
 - [Background execution advice \(blog\)](#)

Questions?

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BACKUP

