Working with GMS in your Enterprise deployment

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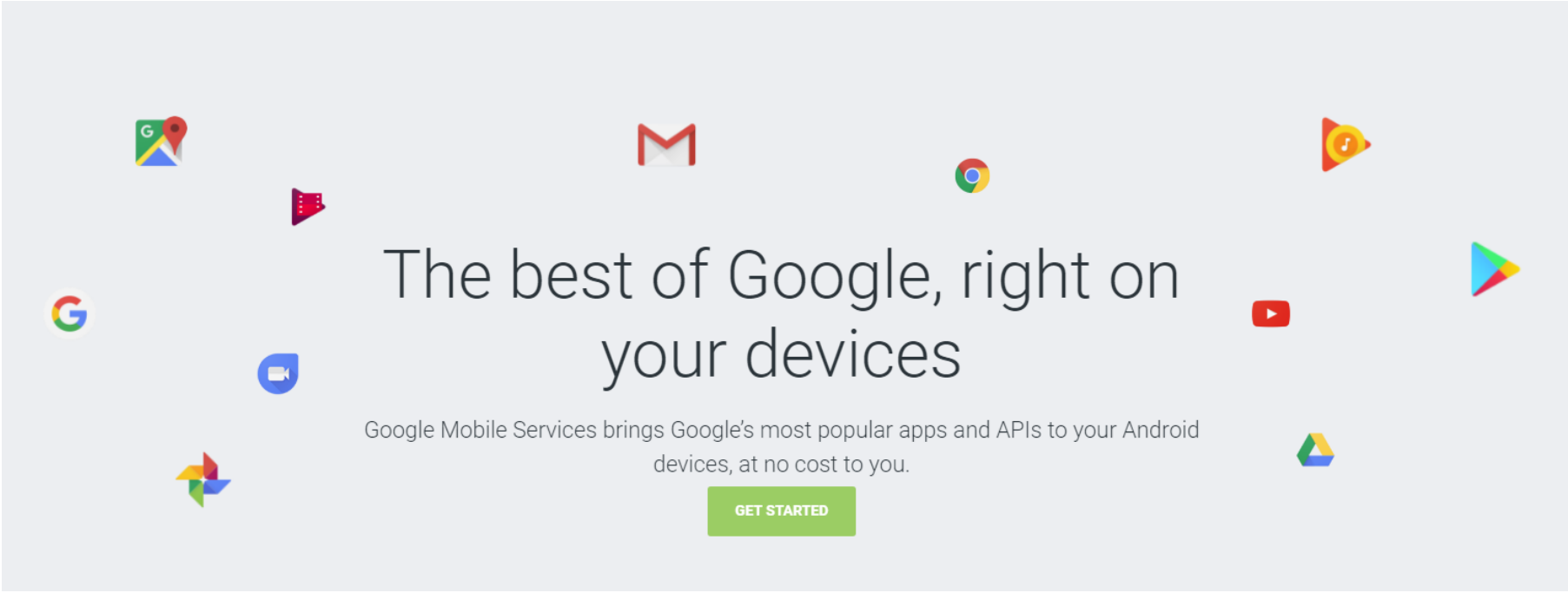
Introduction

Agenda:

- Benefits GMS
- GMS feature differences
- GMS developer (API) differences
- Summary & Resources

Benefits of GMS (Google Mobile Services)

- https://www.android.com/gms/
- Features **on top of** AOSP
- A collection of proprietary applications, APIs and services released by Google to add value and consistency to the Android experience



Benefits of GMS (Google Mobile Services)

- Applications:
  - **Replacing many non-GMS applications with superior offerings**
  - *Maps*, Gmail, *Chrome*, Play Music, Play Movies, Google search, Photos, Duo, YouTube, Drive, *Play Store*
- APIs:
  - https://developers.google.com/android/reference/packages
  - **Maps**, **FCM**, **Awareness**, Drive, Ads, **Vision**, Casting, Authentication, Identity, Wearable, Games, **Safetynet**, Plus **…**
  - **Plus all non-GMS APIs**
- OEMs who deliver GMS devices are required to pass a Compatibility Test Suite (CTS) for all their Android devices

Post series on the developer portal

To support enterprises adopting GMS deployments I have put together a series of blog posts:

- Preventing unattended application updates via the Play Store
- Understanding Google's terms of service
- The managed Google Play Store
- Application deltas between Android GMS and AOSP
- Google location services & tracking
- Factory reset protection
- Set-up wizard

These also cover implications to device management, application management and deployment but it's useful for developers to know this stuff, at least at a high level.

Features: Play Store / Managed Play Store

- Primary distribution channel on GMS devices
  - Other distribution channels still supported and are not going anywhere
    - adb, side loading, Unmanaged EMM provisioning, StageNow…
- Managed vs. Unmanaged Play Store
- Managed vs. Unmanaged Play accounts
- Security benefits with Verify Apps
  - <0.05% of devices that use Playstore have potentially harmful content.
- No legal way to get Play Store apps on AOSP

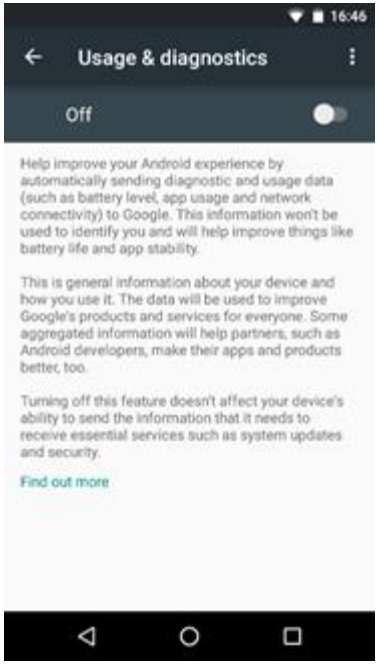
Google Play

Features: Play Store Updates

Component	Update Method
Operating System (security patches, fixes, maintenance releases)	Under full control of EMM / IT Admin
Built in apps not in the Play Store	Updated as part of OS updates
Private applications	Under full control of EMM / IT Admin
Applications downloaded from the Play Store (managed or unmanaged)	**Can be disabled – See post** Google working on feature to control this
GMS Play Services (special case)	For security and integrity reasons, automatically updates to these cannot be disabled (excluding disconnecting the device). **Not an issue if you are not using Play Services**

Features: Google privacy policy & terms of service

- **Multiple types of analytics:**
  - Device analytics
  - Analytics from Google System applications
  - Analytics from 3rd party applications
- **Disabling analytics:**
  - Prevent network access
  - Through settings



Features: Understanding the Application Deltas between AOSP and GMS

GMS replacement applications

- Note: In all instances the AOSP applications receive less frequent updates & have fewer features e.g. no EAS in email.

Non-GMS application	GMS application
AOSP IME	Latin IME
Music	Play Music
Email	Gmail
Calendar	Google Calendar
Browser (Pre N) Chromium (maybe) or 3rd party (N+)	Chrome
Webview	Android System Webview (L/M); Chrome (N+)
People	Google Contacts
Search	Google

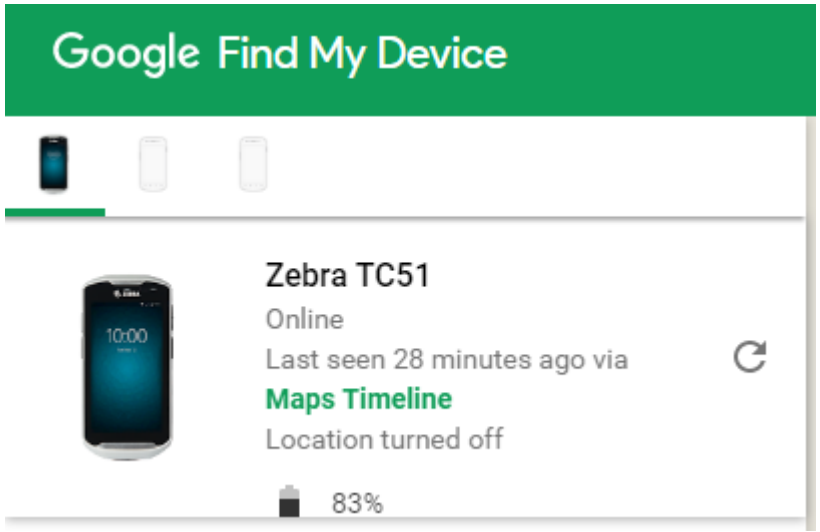
Features: Understanding the Application Deltas between AOSP and GMS

Impact of disabling system applications

Application	Impacts of disabling
Package Installer	Device will not boot
Google Play Services	Any dependant application will be limited in functionality to some capacity
Latin IME	No default keyboard is available. Can use Enterprise Keyboard
Play Store	Play Store application updates no longer possible
Chrome	You will not have a browser but applications with the Webview component continue to function.

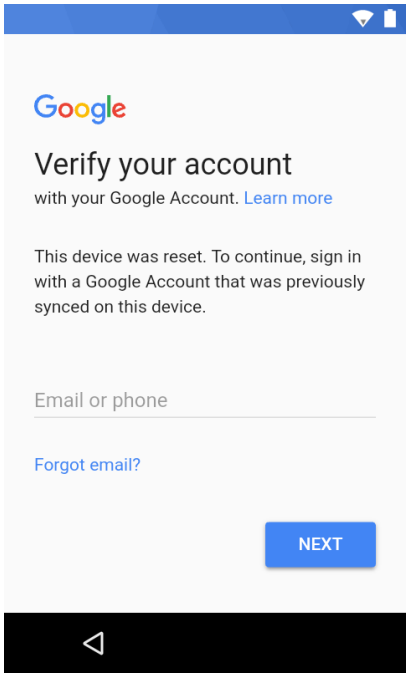
Features: Location services

- Additional developer APIs for locationing
  - More power efficient, better accuracy
- Location settings require separate configuration
  - Enable location
    - Enable “Google’s location service”
  - Enable Wi-Fi and Bluetooth scanning
  - Location accuracy mode
- Location history
- Find my device



Features: Factory Reset Protection

- If (the device has a personal Google account associated with it && An untrusted reset is performed) {Account needs verification on startup;}
- Untrusted reset?
  - Full package update
  - Factory reset package
  - Enterprise reset package
  - Google's find my device



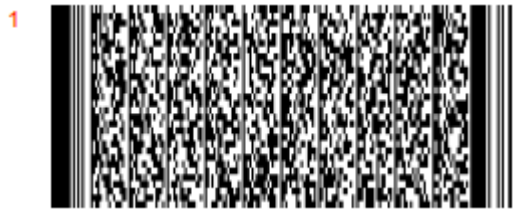
- This is a security feature which Zebra are not enabling any kind of bypass for. Be aware.

Developer differences with GMS

- New **system components** available: Maps, Chrome & Location being the most useful
- A raft of APIs as listed under https://developers.google.com/android/reference/packages, some of which have more applicability in the Enterprise than others:
- Maps, cloud messaging (FCM), Firebase, awareness, fencing, drive, ads, vision, casting, authentication, security, identity, wearable, games…
  - Note: Some portions of Firebase (Not FCM) will work on AOSP also, e.g. our 2016 hackathon winner: https://github.com/darryncampbell/DroidconUK2016Hackathon.
- GMS APIs are a superset of AOSP APIs, i.e. anything that worked on AOSP will work on GMS but not vice-versa. Therefore, beware in mixed-deployments.

Developer: Doze mode

- Doze mode (M+) is part of the AOSP codebase but is only **enabled** in GMS builds
- **Will help extend device battery life**
- Options explained in detail here: https://developer.zebra.com/community/android/android-forums/android-blogs/blog/2017/05/04/keeping-your-application-running-when-the-device-wants-to-sleep
- MX 7.0 introduces the ability to whitelist applications:



```
<wap-provisioningdoc>
  <characteristic version="7.0" type="AppMgr">
    <parm name="Action" value="BatteryOptimization" />
    <parm name="AddPackageNames" value="" />
    <parm name="RemovePackageNames" value="com.example.whitelisted.application" />
  </characteristic>
</wap-provisioningdoc>
```

Developer: Doze mode

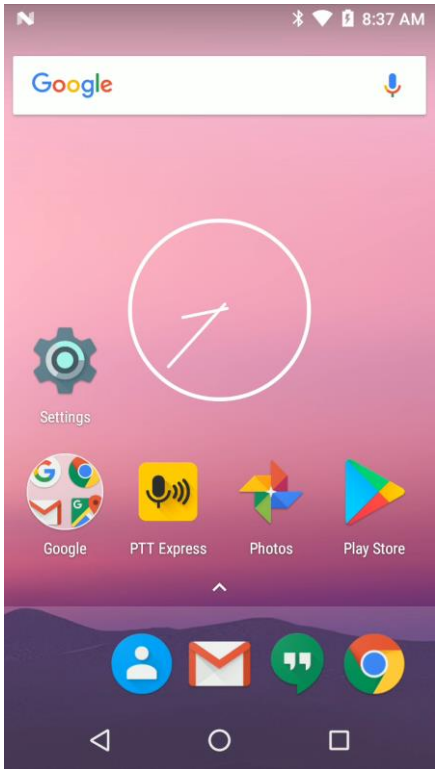
- MX 7.0 introduces the ability to whitelist applications: **Demo**
  - https://github.com/darryncampbell/WakeLock_WifiLock_Exerciser

```
<characteristic type="Profile">
  <parm name="ProfileName" value="BatteryOptimizationProfileRemoveApps"/>
  <parm name="ModifiedDate" value="2017-10-19 12:55:37"/>
  <parm name="TargetSystemVersion" value="7.0"/>
  <characteristic type="AppMgr" version="7.0">
    <parm name="emdk_name" value="BatteryOptimizationProfileRemoveApps"/>
    <parm name="Action" value="BatteryOptimization"/>
    <parm name="RemovePackageNames" value="com.darryncampbell.wakelockexample"/>
  </characteristic>
</characteristic>
```

EMDKConfig.xml

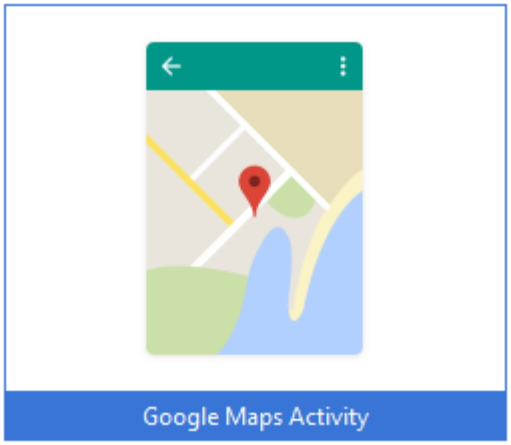
```
//  Add to whitelist / turn off optimization
results = profileManager.processProfile("BatteryOptimizationProfileRemoveApps",
        ProfileManager.PROFILE_FLAG.SET, modifyData);
```

EMDKInterface.java

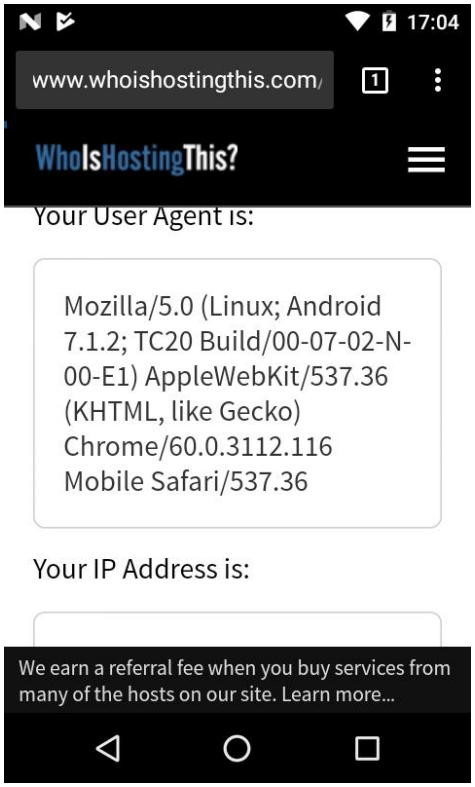


Developer: System applications

- Chrome & Maps among the most useful:



Maps Activity



Chrome on a TC20

Enterprise Browser on a TC20

Developer: SafetyNet API

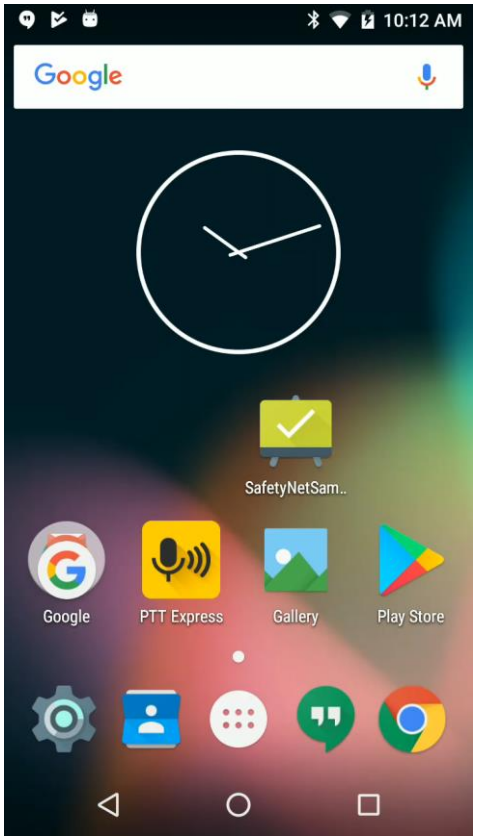
- https://developer.android.com/training/safetynet/index.html
- SafetyNet is umbrella term from Google, currently covers:

API	Function
Attestation API	Ensure the security and compatibility of the Android environment in which the app is running (CTS). **Powerful for developers to ensure they are running on a trusted, non-compromised device.**
Safe Browsing API	Determine whether a URL has been marked as a known threat by Google
reCAPTCHA API	Protect your app from malicious traffic
Verify Apps API	Interact with the VerifyApps feature. Determine its state, request to turn it on and list potentially harmful installed apps

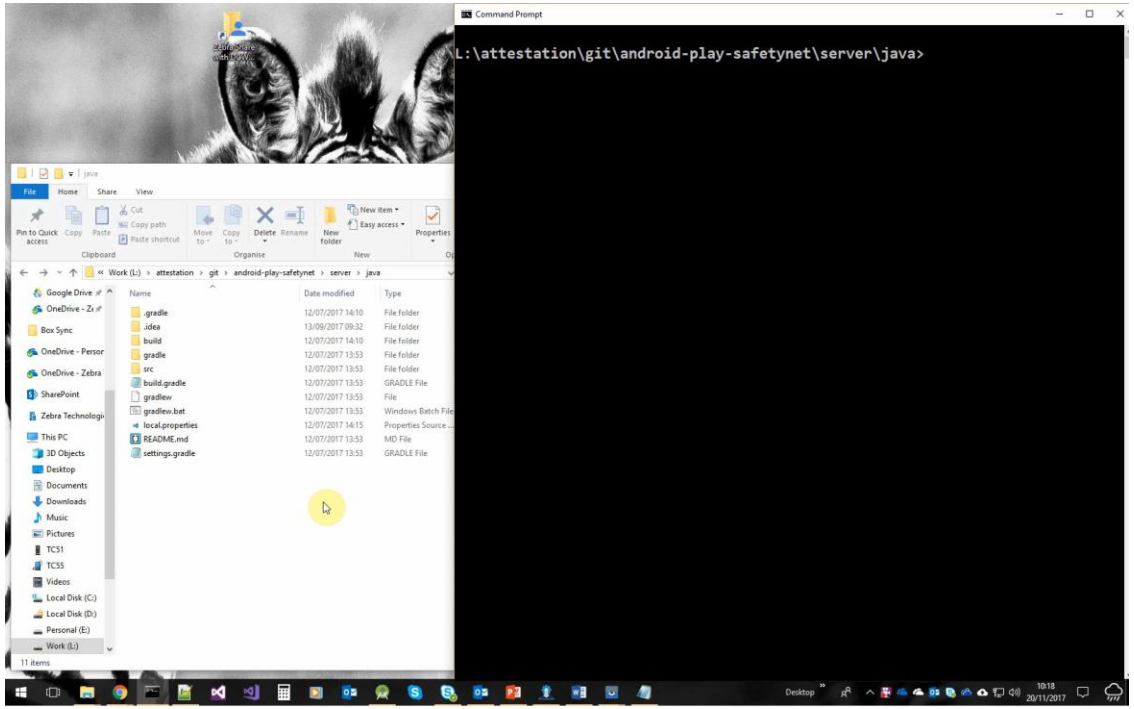
GMS Developer considerations

Developer: SafetyNet API DEMO

- Attestation example: https://github.com/googlesamples/android-play-safetynet/



SafetyNet Attestation: Client



SafetyNet Attestation: Server

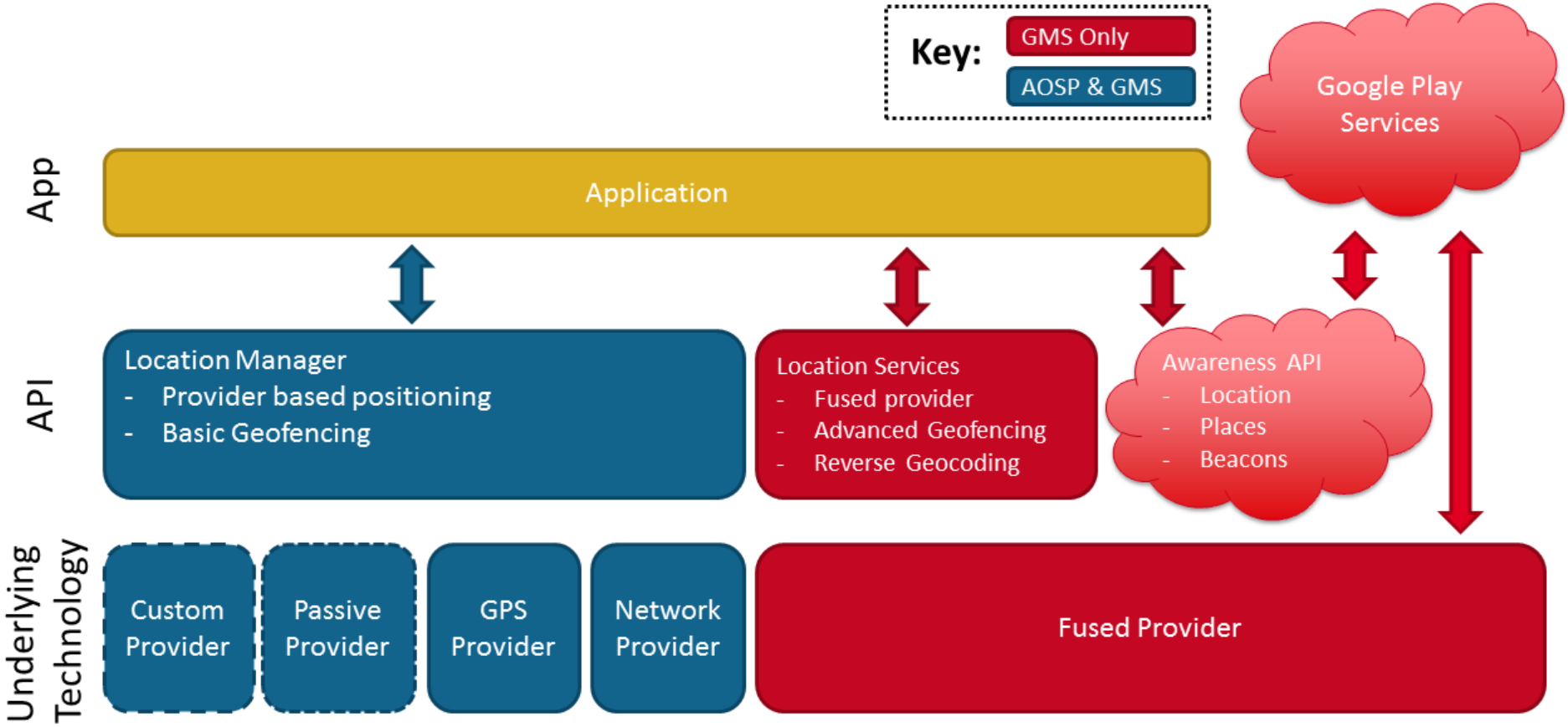
GMS Developer considerations

Developer: Location APIs / Awareness / Fencing

- https://github.com/darryncampbell/Location-API-Exerciser
- https://developer.zebra.com/community/android/android-forums/android-blogs/blog/2017/08/07/location-apis-available-on-gms-aosp-devices
- https://developer.android.com/training/location/index.html

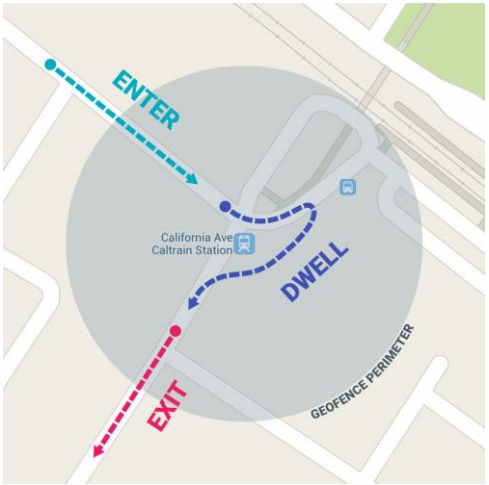
Location Manager	Location Services
AOSP + GMS	GMS Only
https://developer.android.com/reference/android/location/package-summary.html	https://developers.google.com/android/reference/com/google/android/gms/location/package-summary
GPS & Network providers. You manage	Fused provider. Google provides best loc.
Proximity alert – within a given radius of a Lat/Long	Fencing API, detect dwelling and entering / leaving of a specified area
Accuracy is good	Accuracy is better
No activity recognition	Activity recognition (on device): running, walking, cycling, driving.
No Places	Places e.g. nearby areas of interest.
No Geocoding	Geocoding (address translation)

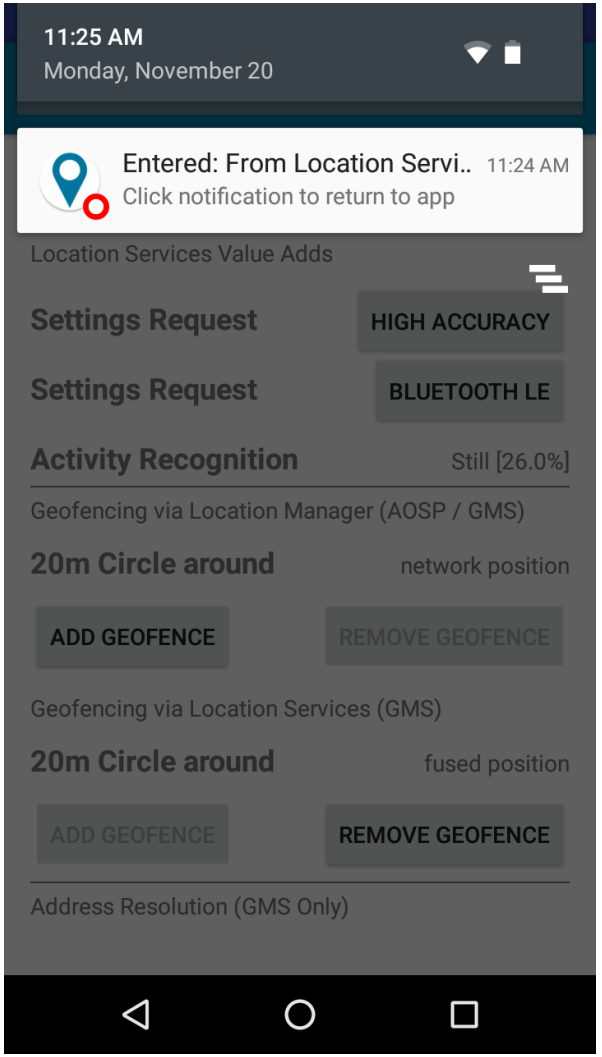
Developer: Location APIs / Awareness / Fencing



Developer: Location APIs / Awareness / Fencing

```
GeofencingEvent geofencingEvent = GeofencingEvent.fromIntent(intent);
int geofenceTransition = geofencingEvent.getGeofenceTransition();
if (geofenceTransition == Geofence.GEOFENCE_TRANSITION_ENTER ||
    geofenceTransition == Geofence.GEOFENCE_TRANSITION_EXIT ||
    geofenceTransition == Geofence.GEOFENCE_TRANSITION_DWELL) {
// Get the geofences that were triggered..
    List<Geofence> triggeringGeofences =
            geofencingEvent.getTriggeringGeofences();
final String geofenceTransitionDetails =
            GeofenceUtilities.getGeofenceTransitionDetails(
                        context,
        geofenceTransition,
        triggeringGeofences);
GeofenceUtilities.sendNotification(geofenceTransitionDetails,
            context, 1);}
```





Developer: Location APIs / Awareness / Fencing

Awareness APIs takes the concept of fencing and allows you to build application logic:

- When (User is near a specific beacon && are stationary)
  - We have confidence our user is in a specific room performing a task
- When (Device is stationary outside of the office fence && it is 7pm)
  - Device has been lost
- When (User is running && device is exiting the building fence)
  - Device is being stolen
- When (User is driving && near flats)
  - Prepare delivery schedule for that building

Developer: Firebase APIs (FCM)

Pros	Not Pros
Hugely flexible - Configurable priorities - Post to topics or groups - Post directly to a device notification - Different priorities - Cross platform	Need to open device to the internet (firewall configuration)
Bypass doze mode & upcoming background restrictions in Oreo	Reliant on external infrastructure. Real time performance concerns?
Recommended provider by Google	Must use Firebase cloud provider
Push messaging has been a challenge for our Enterprise customers	Does not work on non-GMS. Mixed deployments are complex.
Message analytics	
Firebase cloud provider is extremely popular and offers other services, accessible from the same console.	

Developer: Other useful APIs

- Vision (https://developers.google.com/vision/)
  - Detect faces
  - Scan barcodes
    - Designed more for AR scenarios rather than intensive barcode scanning but is an interesting technology.
  - Recognize text
- Casting

Other considerations

Resources

- Related Blogs:
  - https://developer.zebra.com/community/android/android-forums/android-blogs/blog/2017/05/04/keeping-your-application-running-when-the-device-wants-to-sleep
  - https://developer.zebra.com/community/android/android-forums/android-blogs/blog/2017/08/07/location-apis-available-on-gms-aosp-devices
- Sample Apps shown in this presentation:
  - https://github.com/darryncampbell/Location-API-Exerciser
  - https://github.com/googlesamples/android-AppRestrictionSchema/
  - https://github.com/googlesamples/android-play-safetynet/
  - https://github.com/GoogleCloudPlatform/cloud-vision/tree/master/android/CloudVision
  - https://github.com/darryncampbell/WakeLock_WifiLock_Exerciser
- Videos shown during this presentation:
  - https://www.youtube.com/playlist?list=PLj8D9Diz5FBplYnMyQJz20o1mtrHxGLPJ

Questions?