Project Treble. What Makes Android 8 different?
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Background

• We were helping SoC and device manufacturers to make their devices run Android for some time now...

• This guy felt different ...because of Treble.
Agenda

• What is Treble?
• Why Google needed it?
• How much effort was it to implement?
• What are the Treble components?
• Are there any problems with it?
• What will be new about it in Android 9?
Quotes from Google

• “Project Treble is probably the biggest re-architecture of Android since it started.“
  Dave Burke, Android's VP of engineering.

• "I don't think there's ever been something remotely even close to the complexity of Treble in terms of infrastructure change to the platform."
  Romain Guy, Android's Graphics lead engineer

• “Treble involved upwards of 300 developers within Android engineering itself contributing to this, across 30 teams.“
  Iliyan Malchev, the head of Project Treble
• Android 8.0 re-architected the Android OS framework (in a project known as Treble) to make it easier, faster, and less costly for manufacturers to update devices to a new version of Android. © Google
AOSP Architecture

- Android System Services and everything above is “Android Framework”. It’s basically provided by Google.

- HALs and Kernel are provided by SoC and Hardware vendors.
Why Google needed Treble?

• Step 1 to Step 5 used to take 6-12 months (That if device manufacturers bothered with updates at all)
Why upgrade took so much time?

- Google realized that application developers will need fixed APIs
- But they failed to realize that device vendors would need the same...
- This red line on the right didn’t actually exist before Treble
Treble components

- New HAL types
- Hardware Interface Definition Language (HIDL)
- New Partitions
- ConfigStore HAL
- Device Tree Overlays
- Vendor NDK
- Vendor Interface Object
- Vendor Test Suite (VTS)
• Before Treble HAL interfaces were defined as a bunch of C header files in `hardware/libhardware` folder. Each new version of Android meant new interface that HAL needed to support.
Pass-through HALs

- Pass-through HALs have HIDL interface, but you call them directly from your process, not through Binder.
Binderized HALs

- Binderized HALs run in their own process and accessible only thru Binder IPC calls
- Google already created a wrapper for Legacy HALs
Ideal HALs

• Binderized HALs as they are meant to be...

• We didn’t bother with them though...

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Vendor Interface Object

• 4 things need to match for upgrade to be successful:
  • HALs (versions and interfaces)
  • Kernel (version and configs)
  • SE Policy (Security Policy versions)
  • AVB (Android Verified Boot) library version
New partitions

- Now everybody needs to support the “Golden Image”. This is a reference /system image that you can put on your device and it must run.
Vendor Test Suite

- VTS is essentially the same thing as CTS, but few layers deeper into the system
Problems with Treble?

- Updating BSP to support Treble is a huge effort for SoC vendor
- You’ll always need pass-tough HALs
- Big change means many bugs
- Uniformity could bring sameness
What’s new in Android P for Treble?

- Most of the Treble was done in Oreo. Android 9 has only a few final touches to add.

- Android P Beta is officially available on 12 devices.

- Mandatory target API level for app developers. API level 26 (Android 8.0) is mandatory for all new apps now.
Summary

- Project Treble is a fix for an old architectural mistake in Android
- Google has to pay for this mistake
- We also paid for this mistake...
- Despite all Project Treble was successful
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