Project Treble. What Makes Android 8 different?

MERA

Introduction

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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

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*

Before Treble

Android 8

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AOSP Architecture
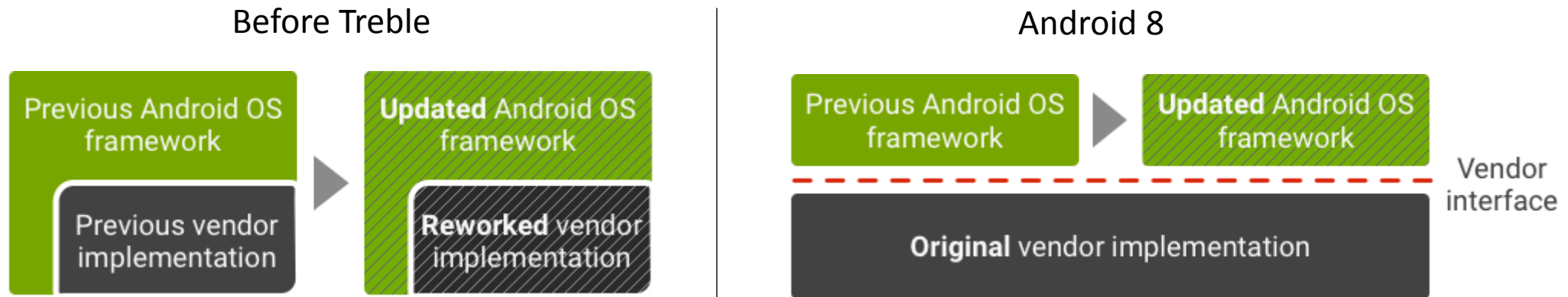
- Android System Services and everything above is "Android Framework". It's basically provided by Google.
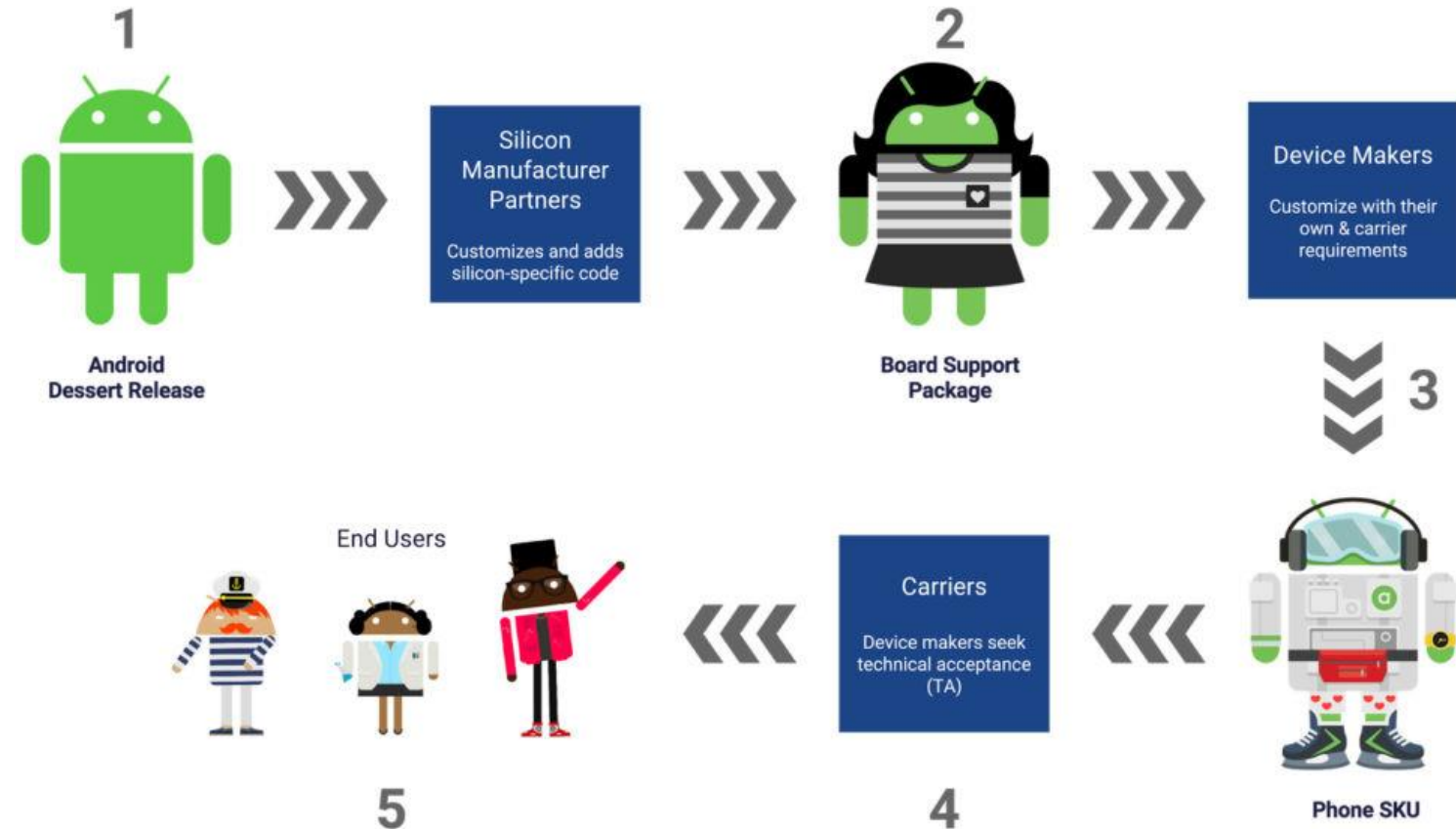
- HALs and Kernel are provided by SoC and Hardware vendors.

Why Google needed Treble?

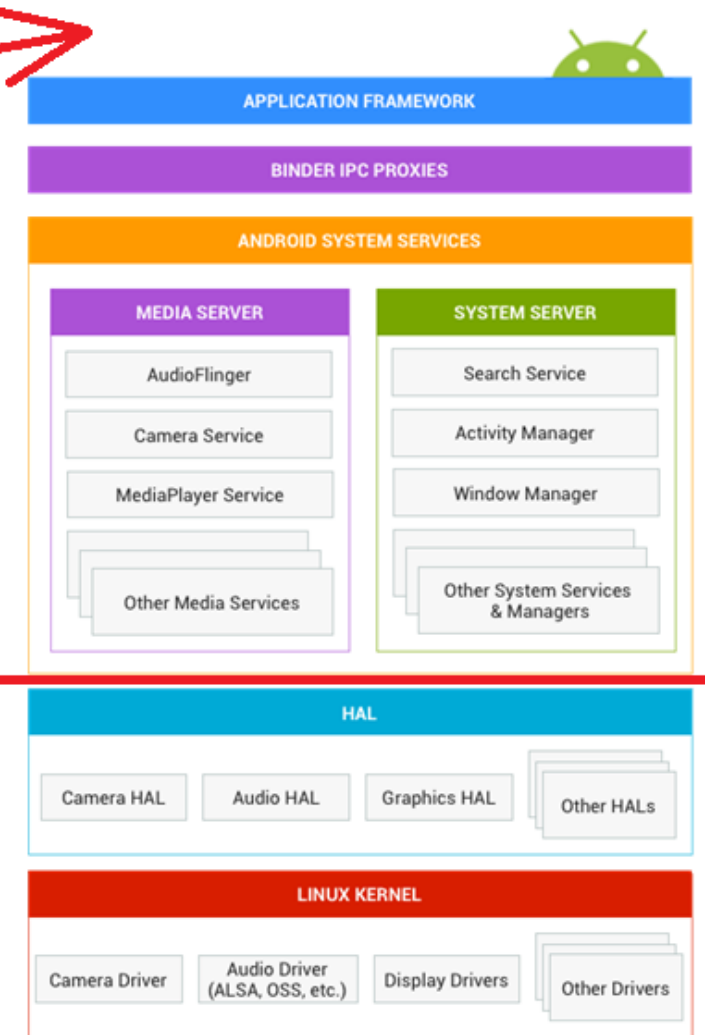- Step 1 to Step 5 used to take 6-12 months *(That if device manufacturers bothered with updates at all)*

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

Applications

Google

SoC Vendor

APPLICATION FRAMEWORK

BINDER IPC PROXIES

ANDROID SYSTEM SERVICES

MEDIA SERVER	SYSTEM SERVER
AudioFlinger	Search Service
Camera Service	Activity Manager
MediaPlayer Service	Window Manager
Other Media Services	Other System Services & Managers

HAL

| Camera HAL | Audio HAL | Graphics HAL | Other HALs |

LINUX KERNEL

| Camera Driver | Audio Driver (ALSA, OSS, etc.) | Display Drivers | Other Drivers |

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)**

HALs before Treble

- 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.
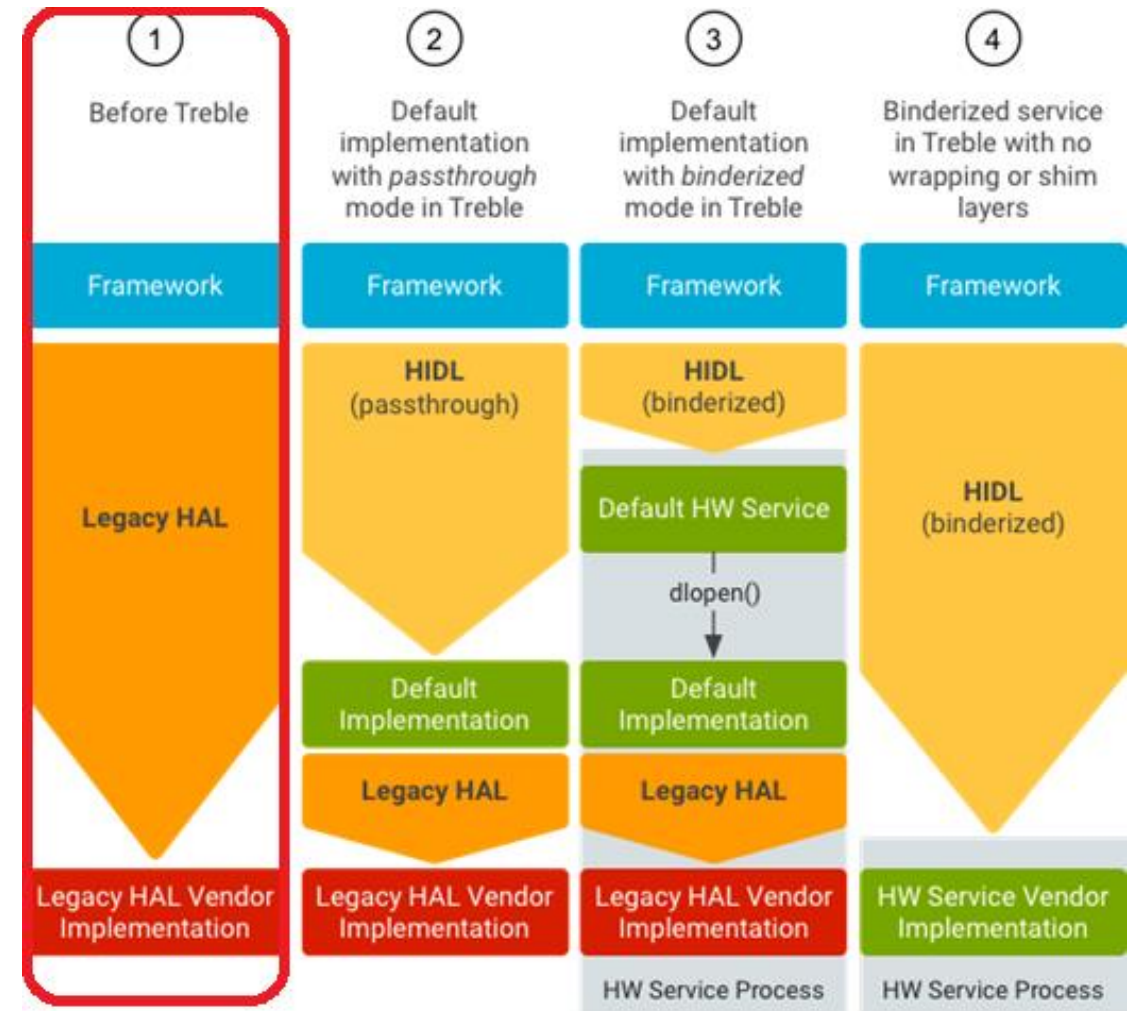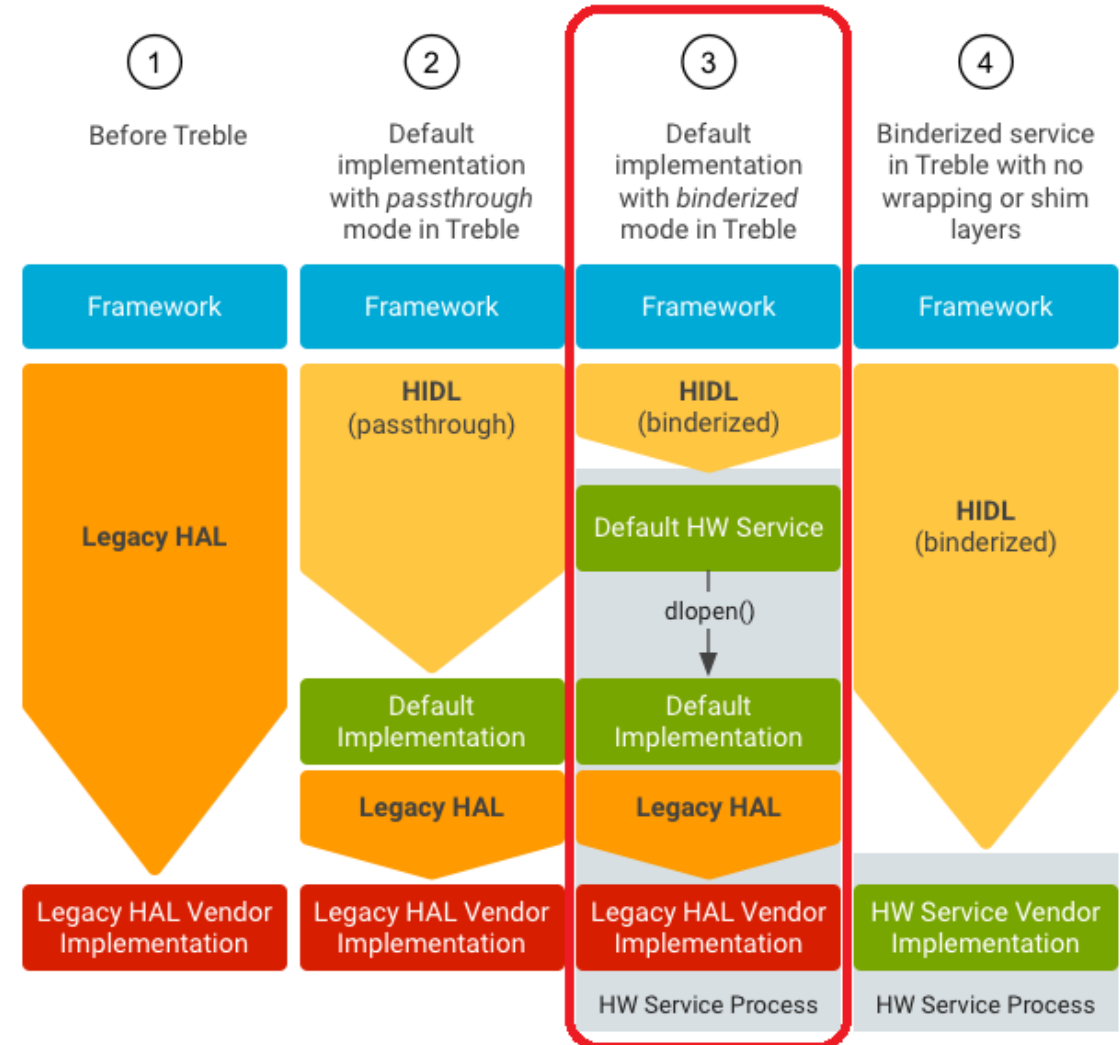
Pass-through HALs

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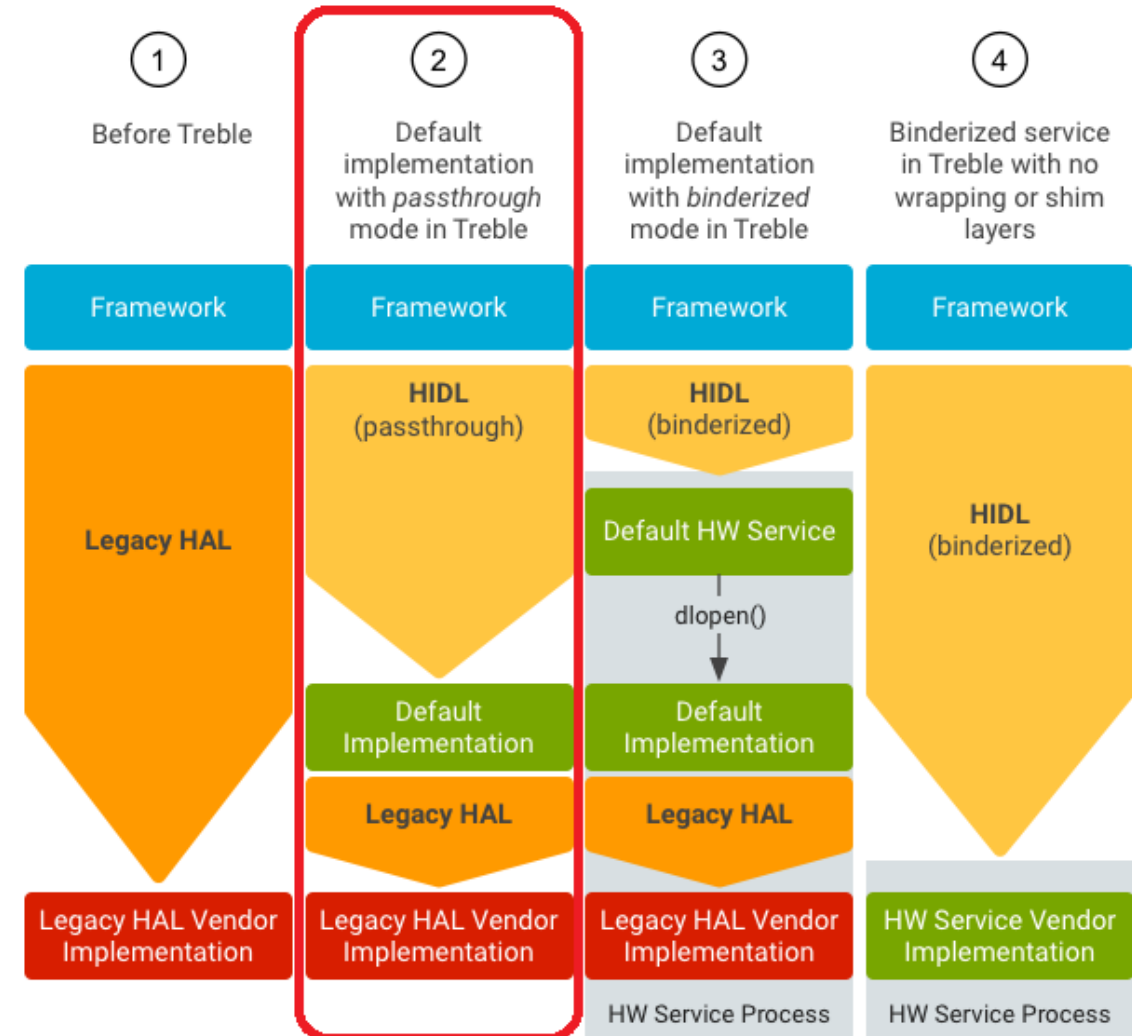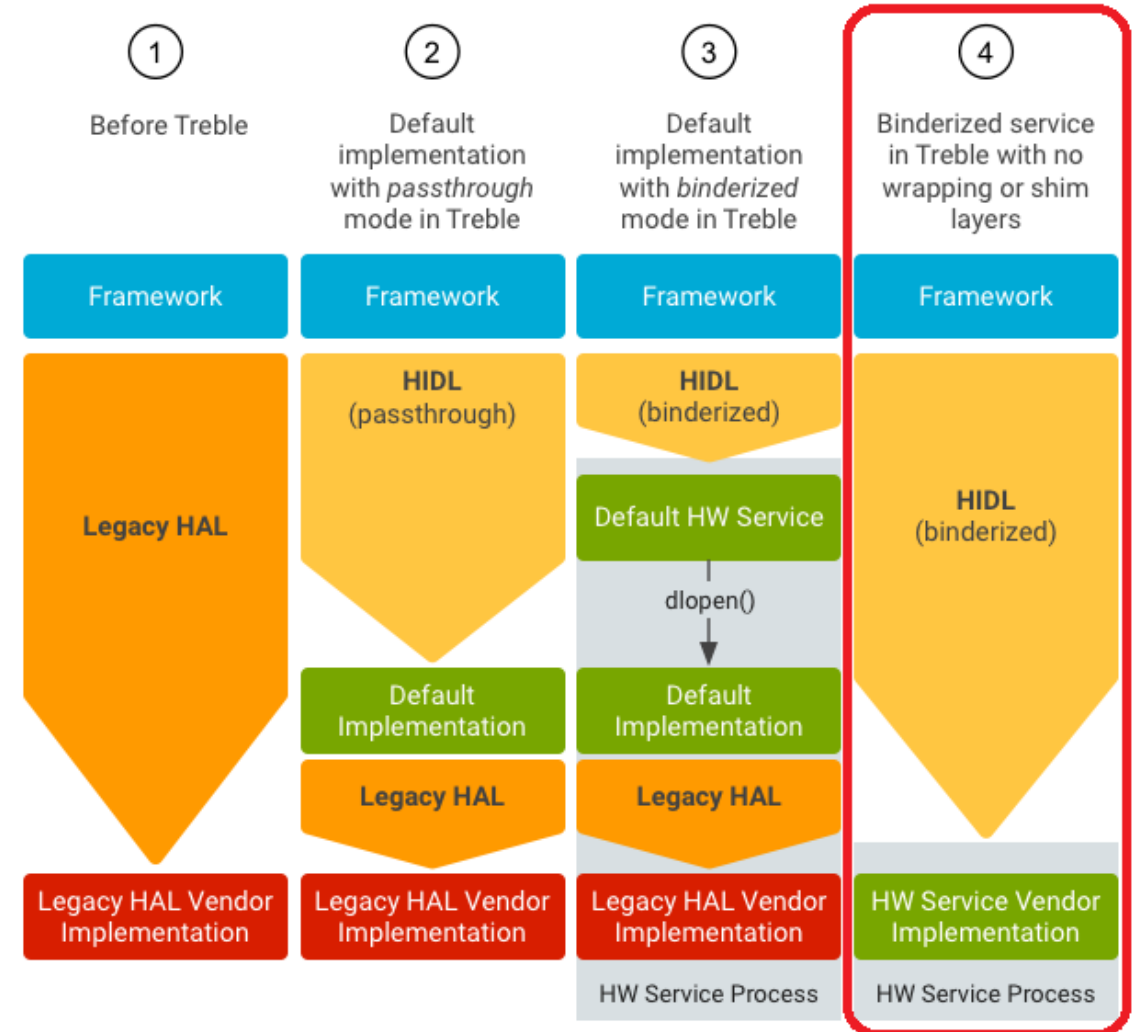
Binderized HALs

- Binderized HALs run in their own process and accessible only thru Binder IPC calls

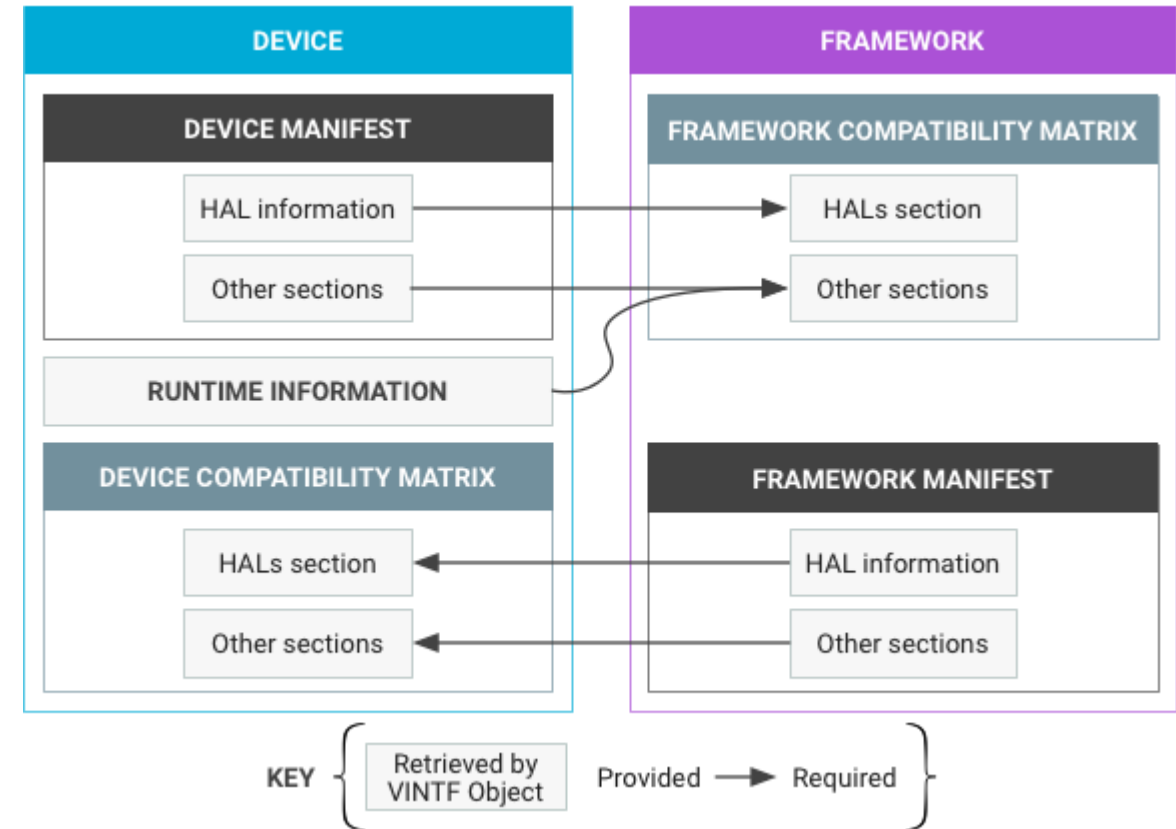- Google already created a wrapper for Legacy HALs

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Ideal HALs

- Binderized HALs as they are meant to be…

- We didn't bother with them though…
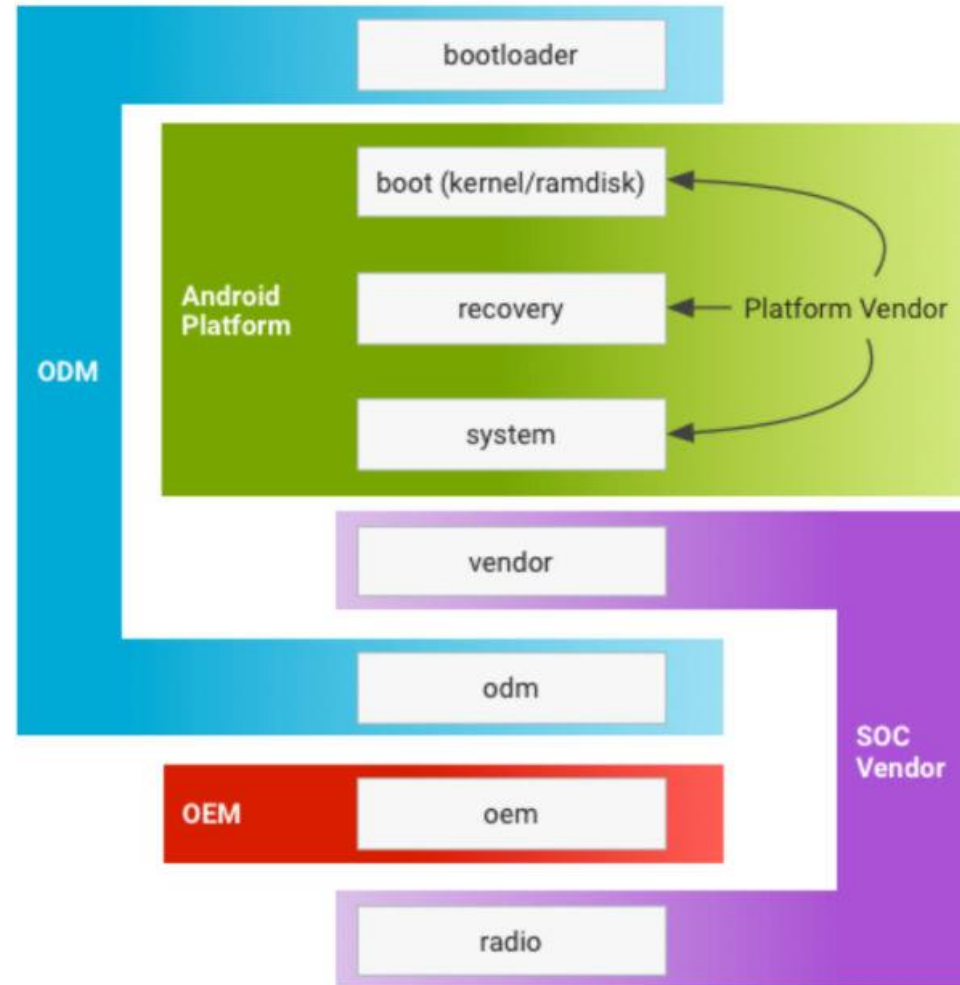
Vendor Interface Object

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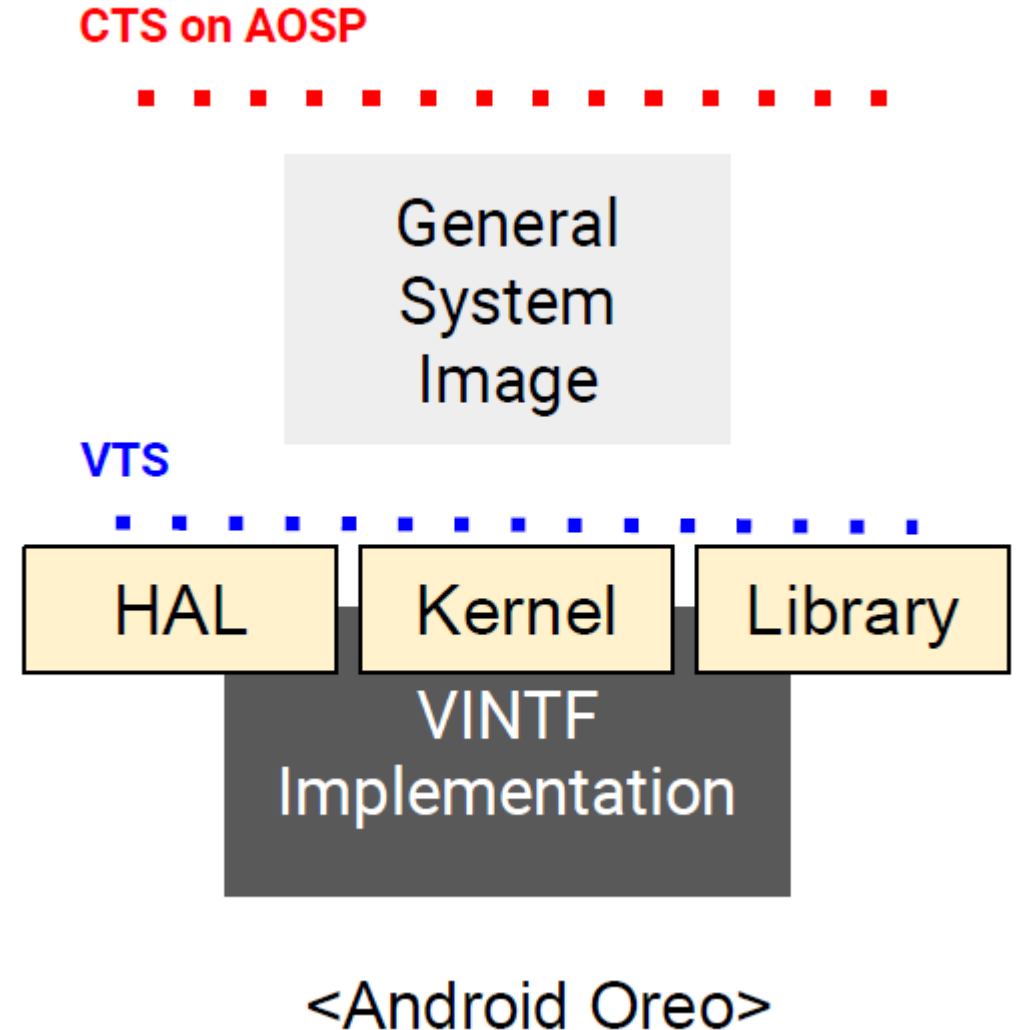 - AVB (Android Verified Boot)

    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

CTS on AOSP

General System Image

VTS

HAL	Kernel	Library

VINTF Implementation

\<Android Oreo\>

Problems with Treble?

- Updating BSP to support Treble is a huge effort for SoC vendor

- You'll always need pass-trough 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

Q&A

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