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Running Android on the Mainline Graphics Stack

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@memcpy_io

Open First

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Agenda

- Android History
- Android on Mainline
- Current Status
- Big Picture

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Android History

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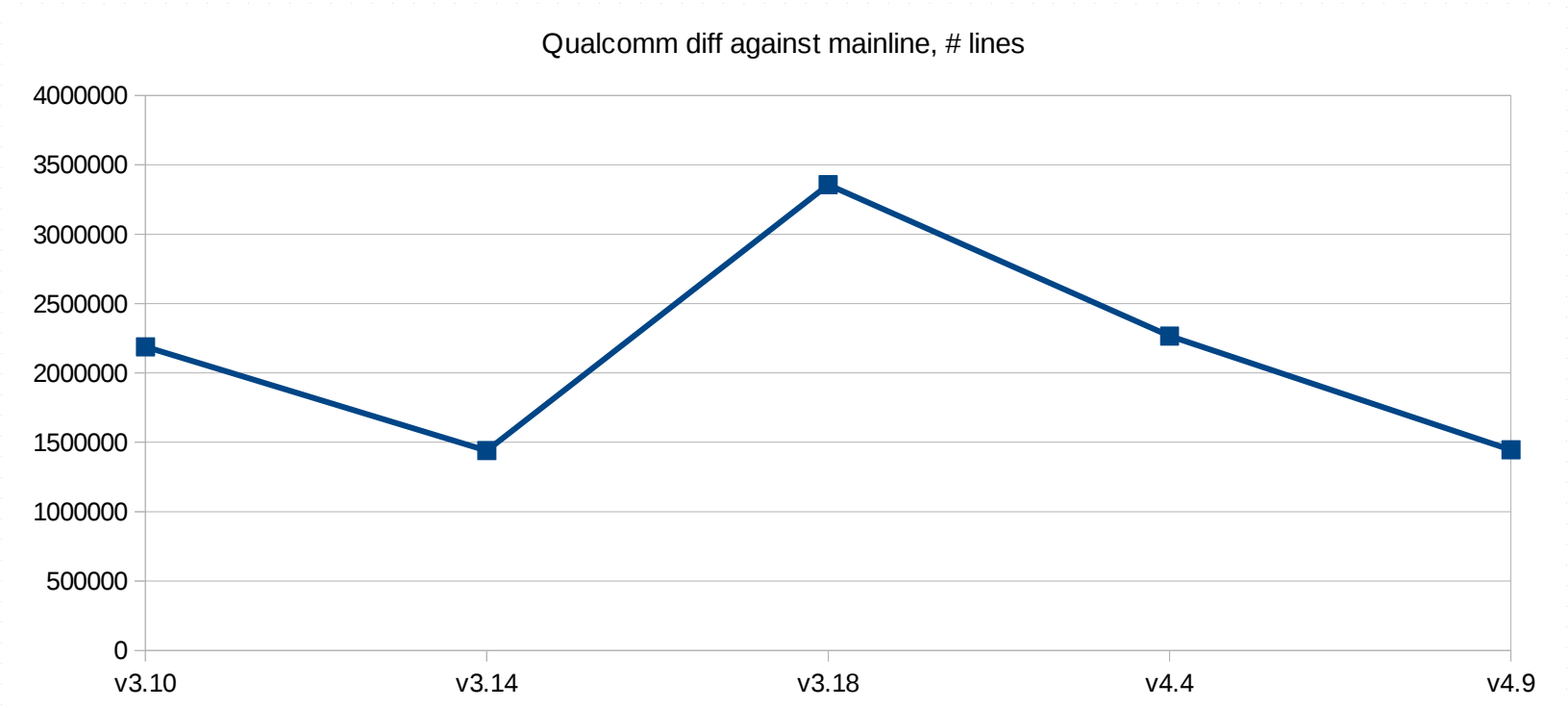
Android History



Android History

- Android forked the Kernel

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Android History

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  - Better Graphics stack was needed

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  - Support for low power was lacking

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Android History

- Android forked the Kernel
  - Better Graphics stack was needed
  - Support for low power was lacking
  - Support for atomic operations missing

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Android History

- Android forked the Kernel
- Android Atomic Display Framework created

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Android History

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  - Not extensible or generic

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  - Not upstreamable

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Android History

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- Android Atomic Display Framework created
- Mainline Atomic KMS ABI introduced
  - Supports the ADF usecases
  - Uses Properties to be generic
  - Is now replacing ADF in vendor drivers

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Android on Mainline

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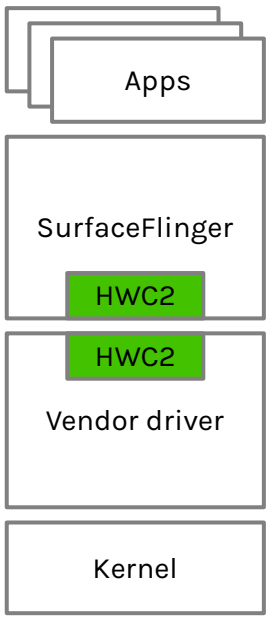
Android Graphics Stack



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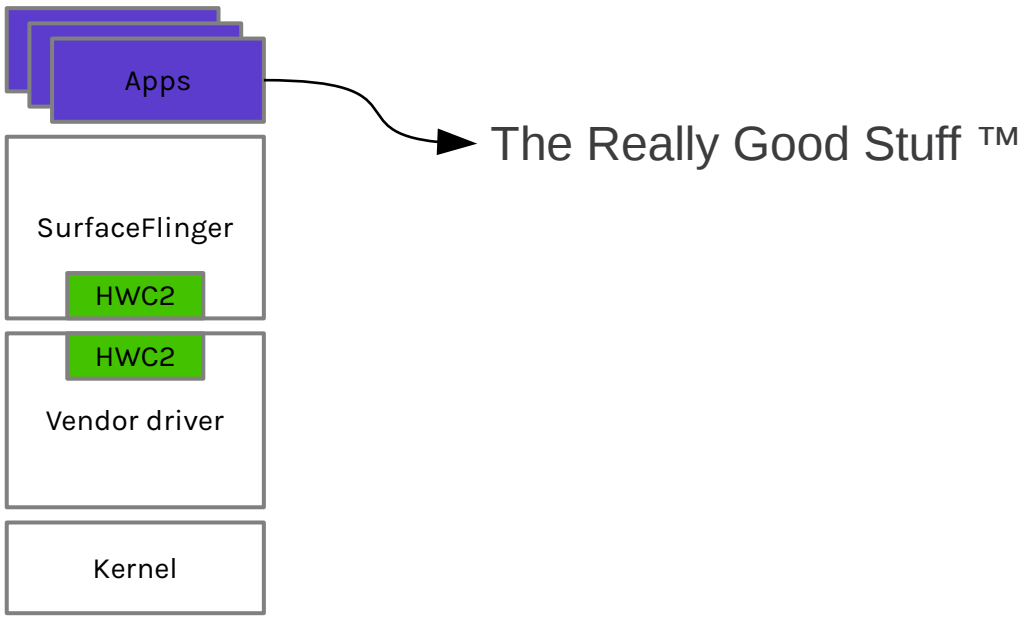
Android Graphics Stack



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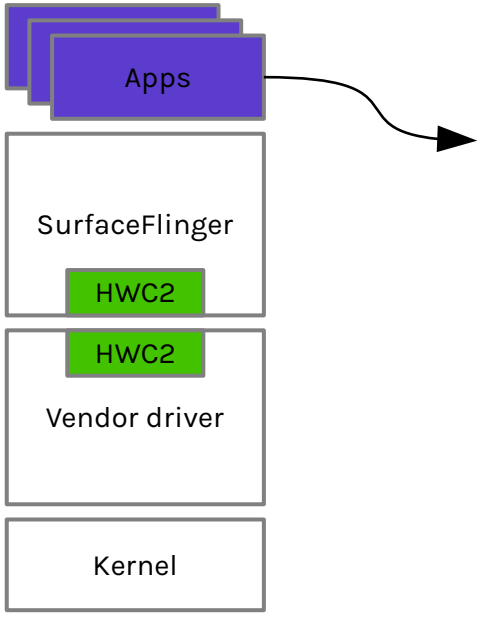
Android Graphics Stack



The Really Good Stuff ™
- No really, this is the whole point!

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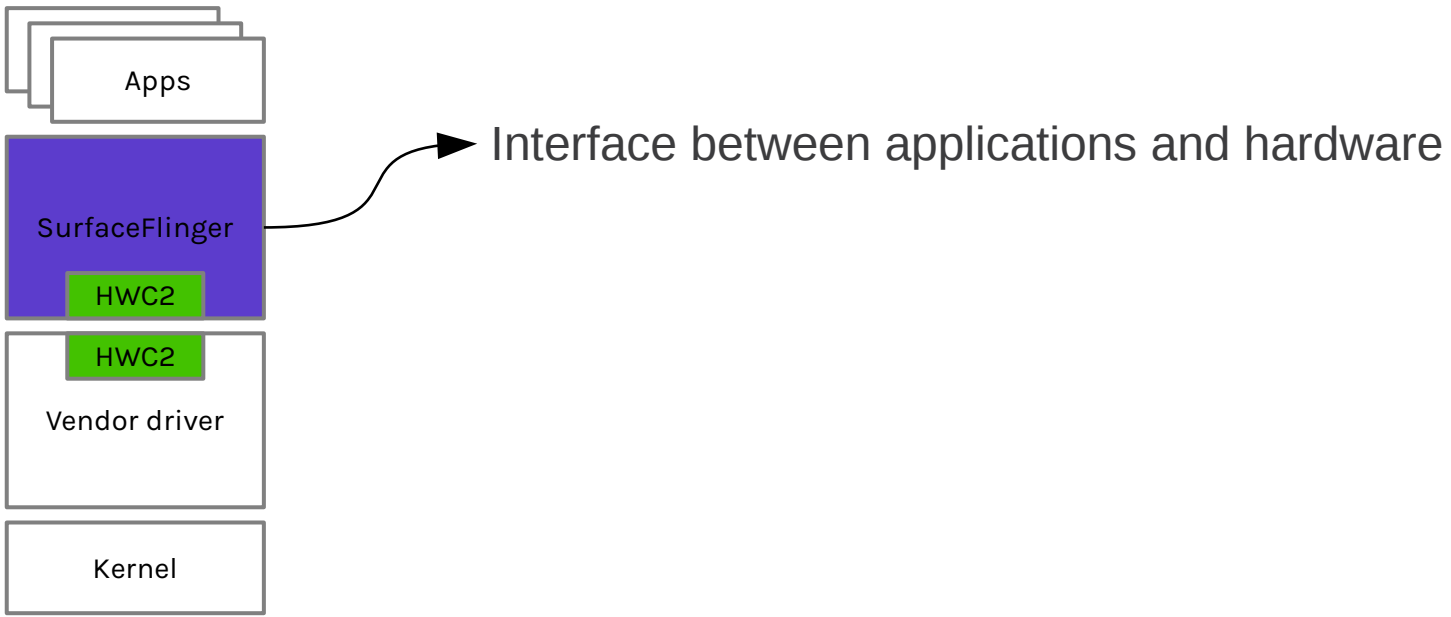
Android Graphics Stack



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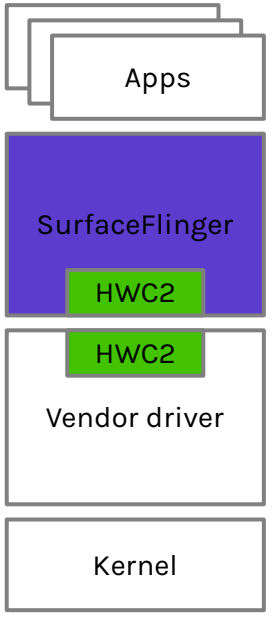
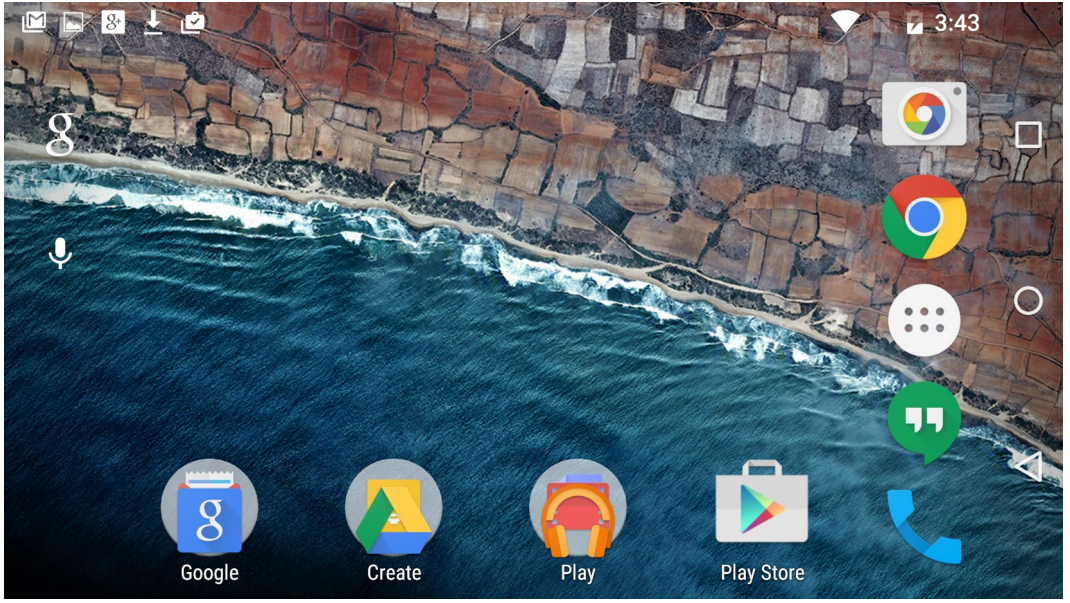
Android Graphics Stack





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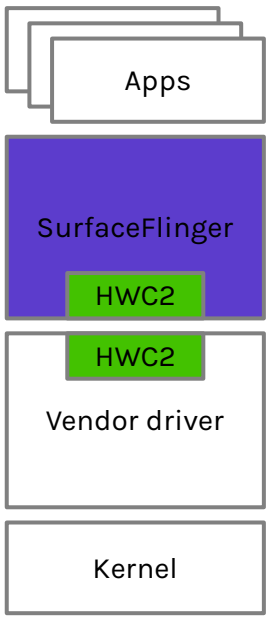
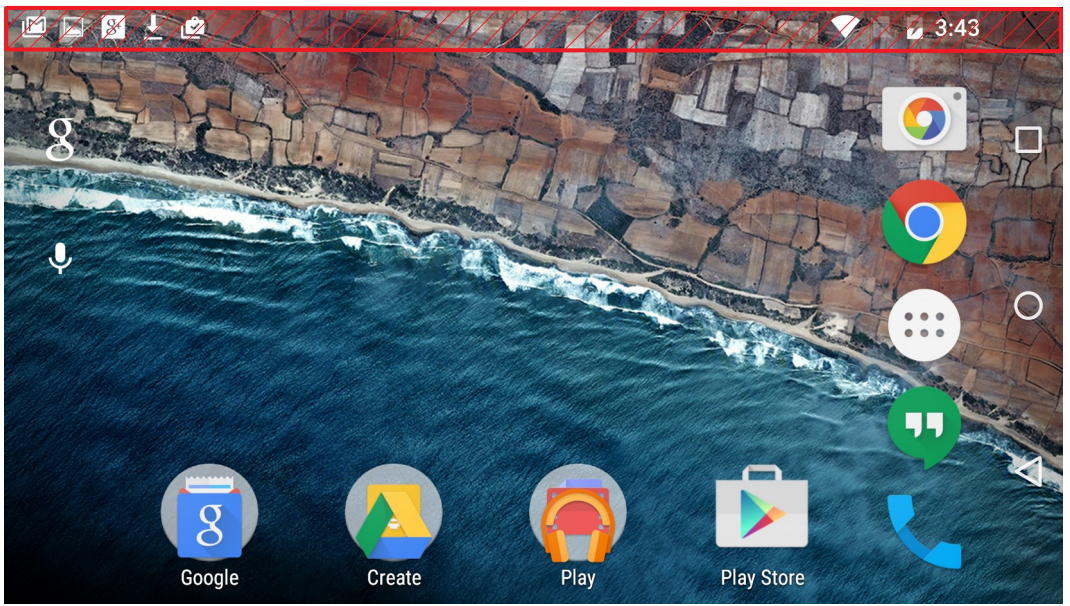


Status Bar



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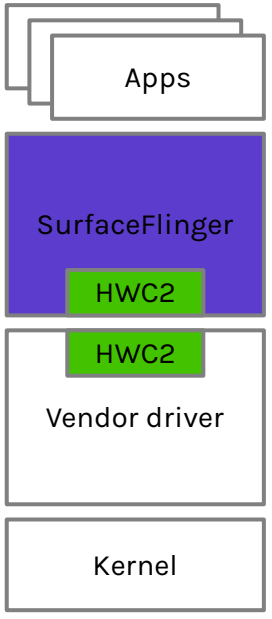

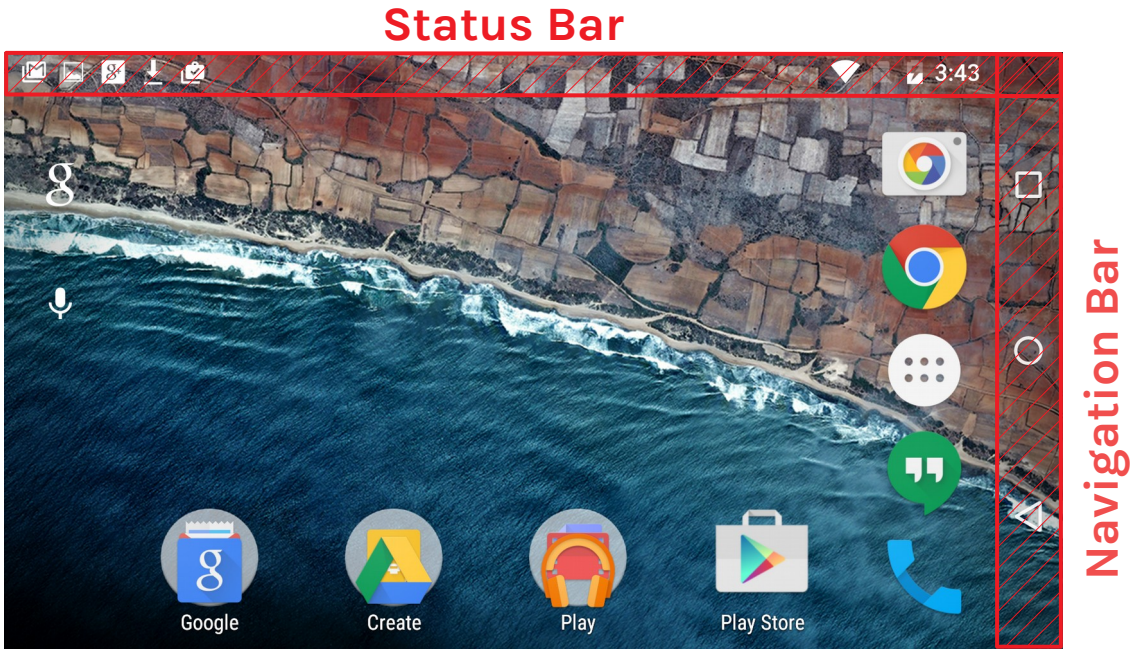

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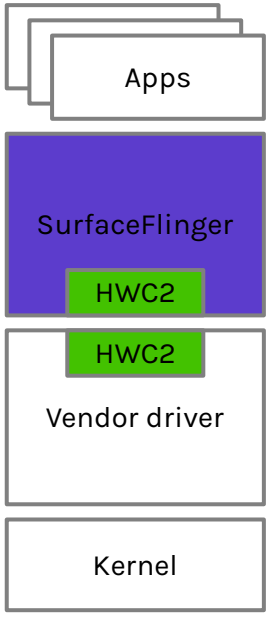

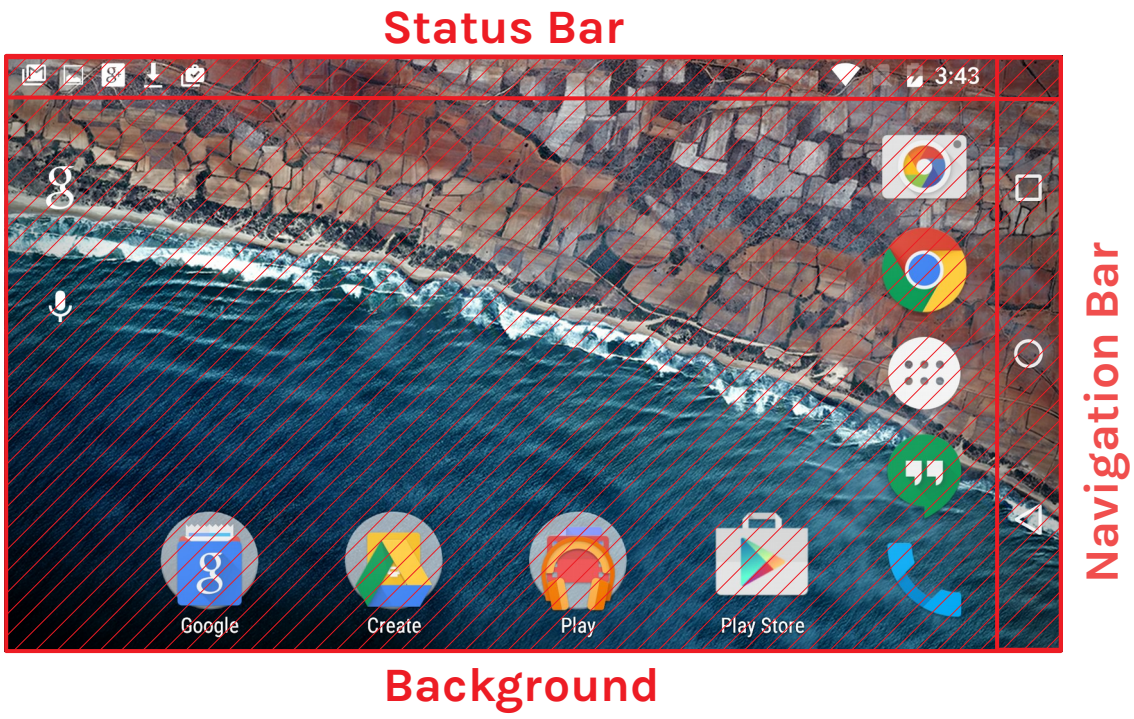

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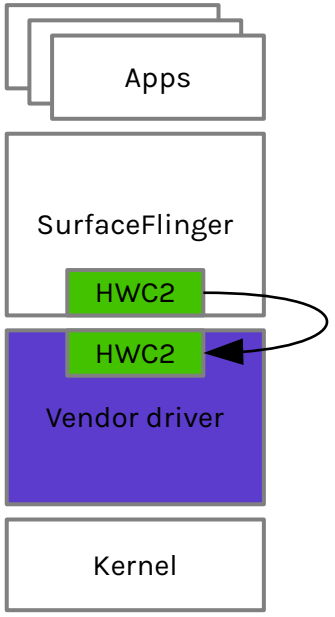

SurfaceFlinger speaks HWC to the Composer

Android Graphics Stack

What does the Hardware Composer do?

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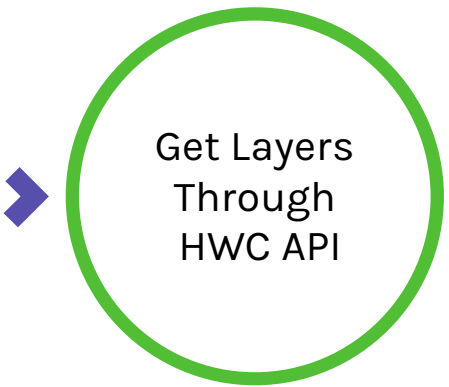
Android Graphics Stack

What does the Hardware Composer do?



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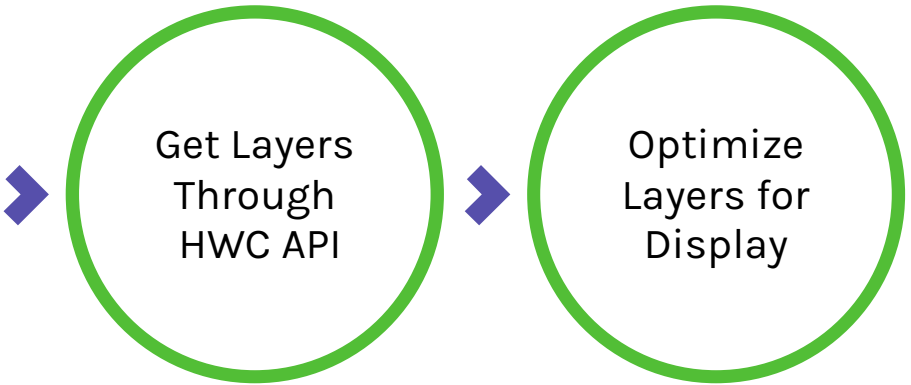

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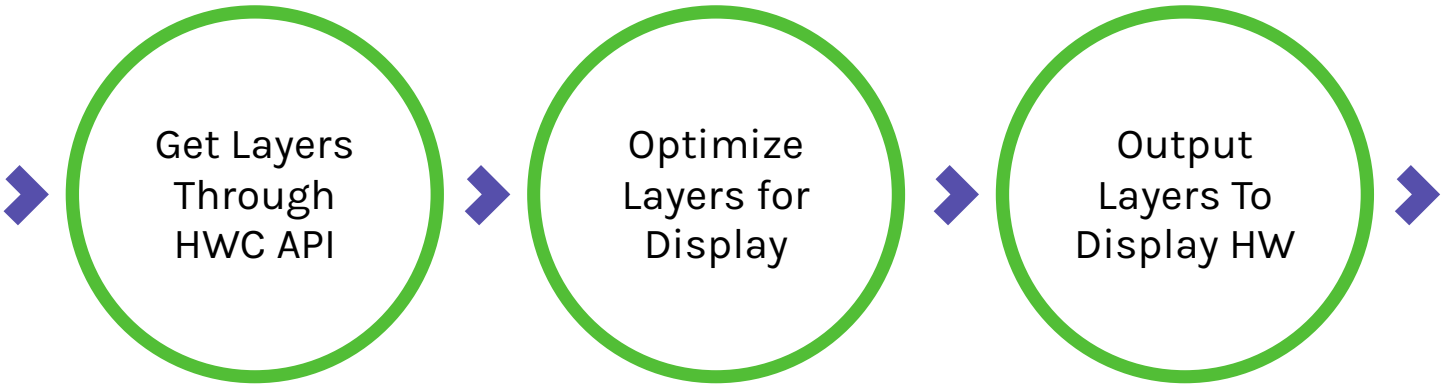

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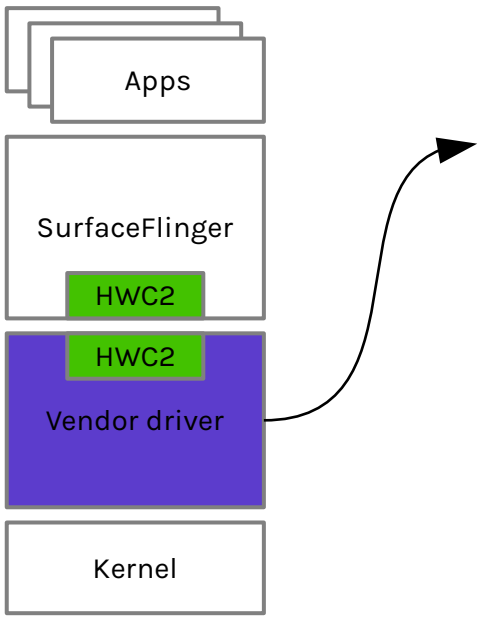

The non-kernel part of the graphics driver

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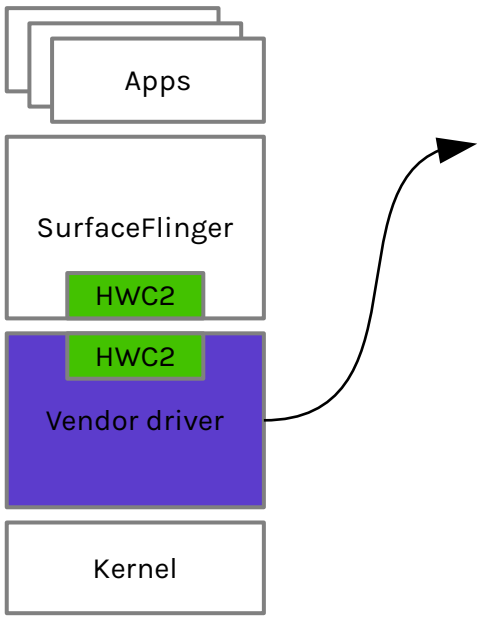
Android Graphics Stack



The non-kernel part of the graphics driver
- Hardware Composer

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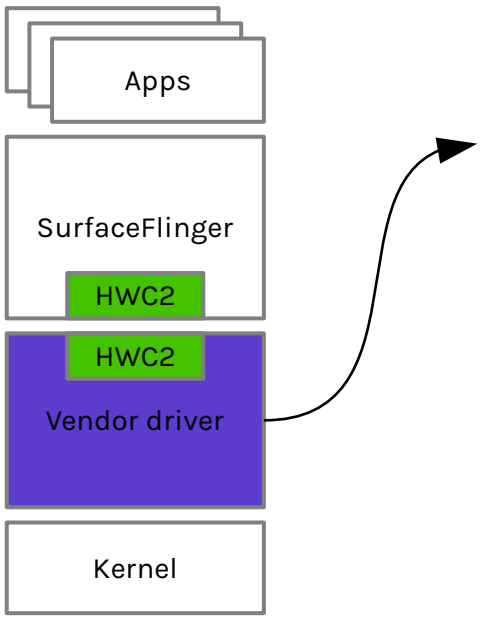
Android Graphics Stack



The non-kernel part of the graphics driver
- Hardware Composer
- OpenGL, Vulkan, memory allocator, etc.

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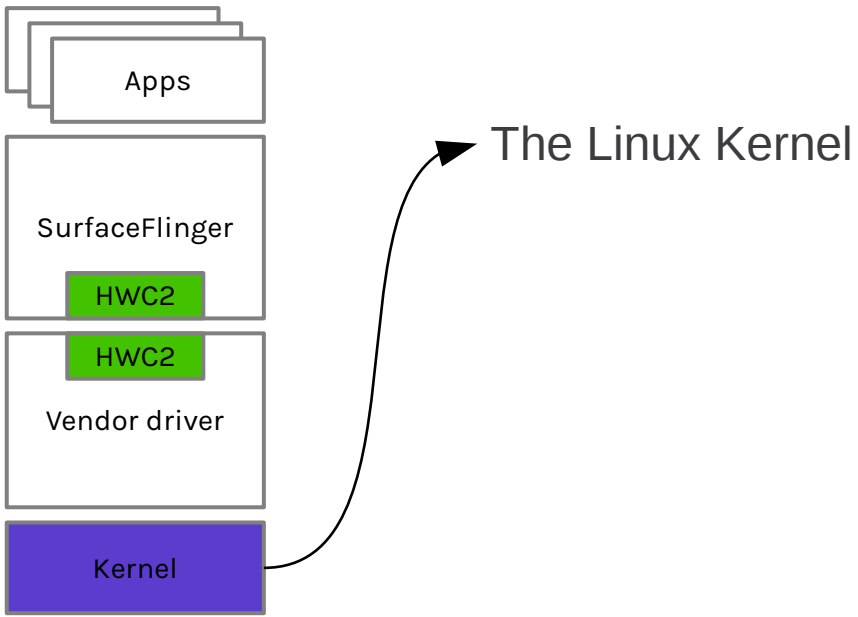
Android Graphics Stack



Mainline Graphics Stack

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  - Android requires HWC implementation
  - Mesa and the Kernel does not implement it
  - drm_hwcomposer does!

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Mainline Graphics Stack

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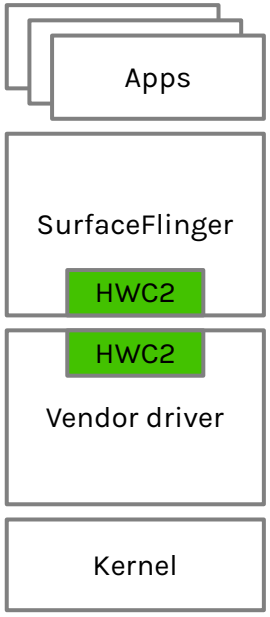

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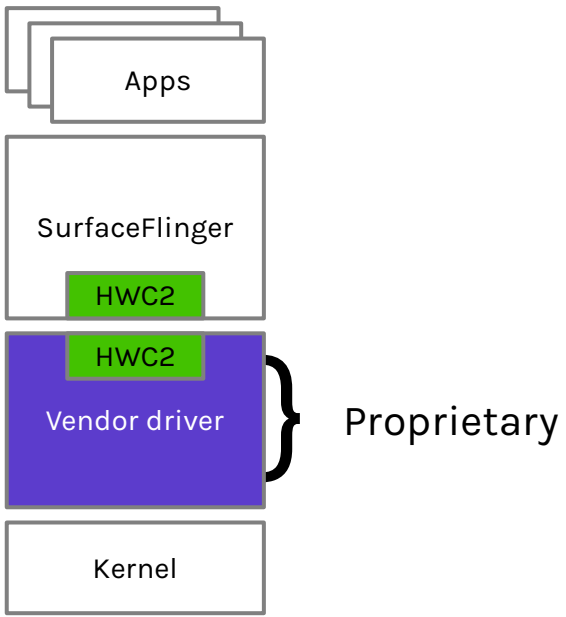

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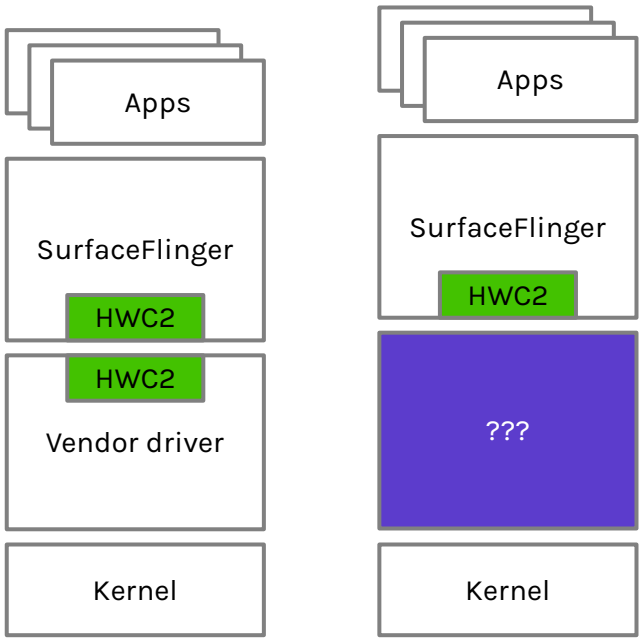

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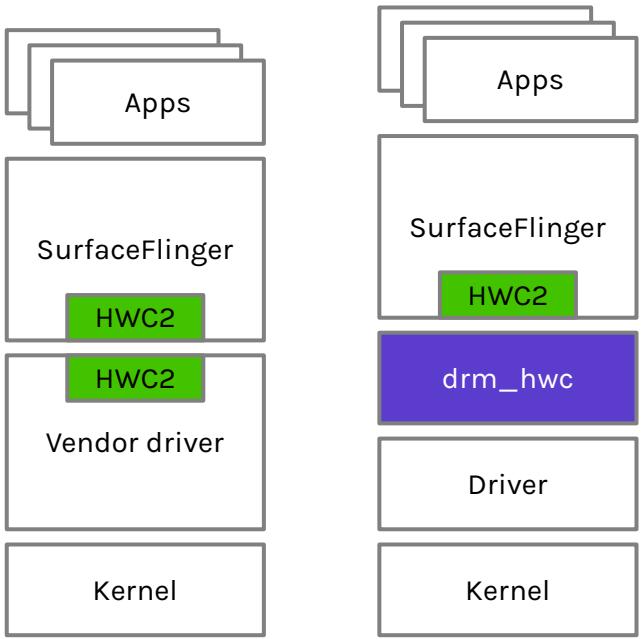

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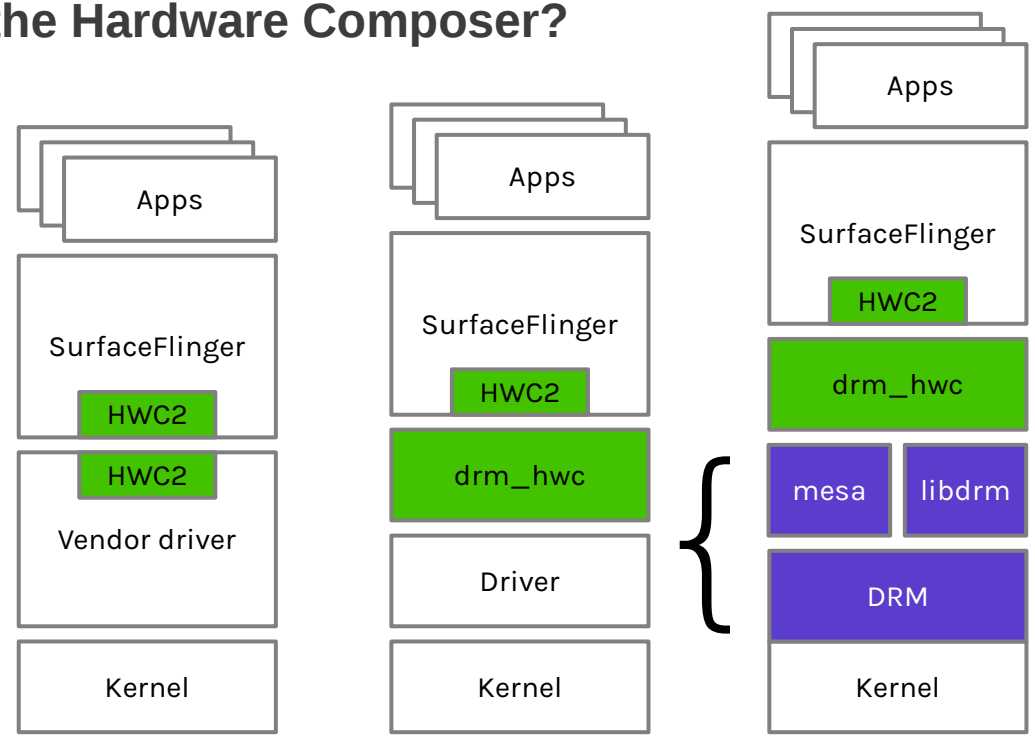

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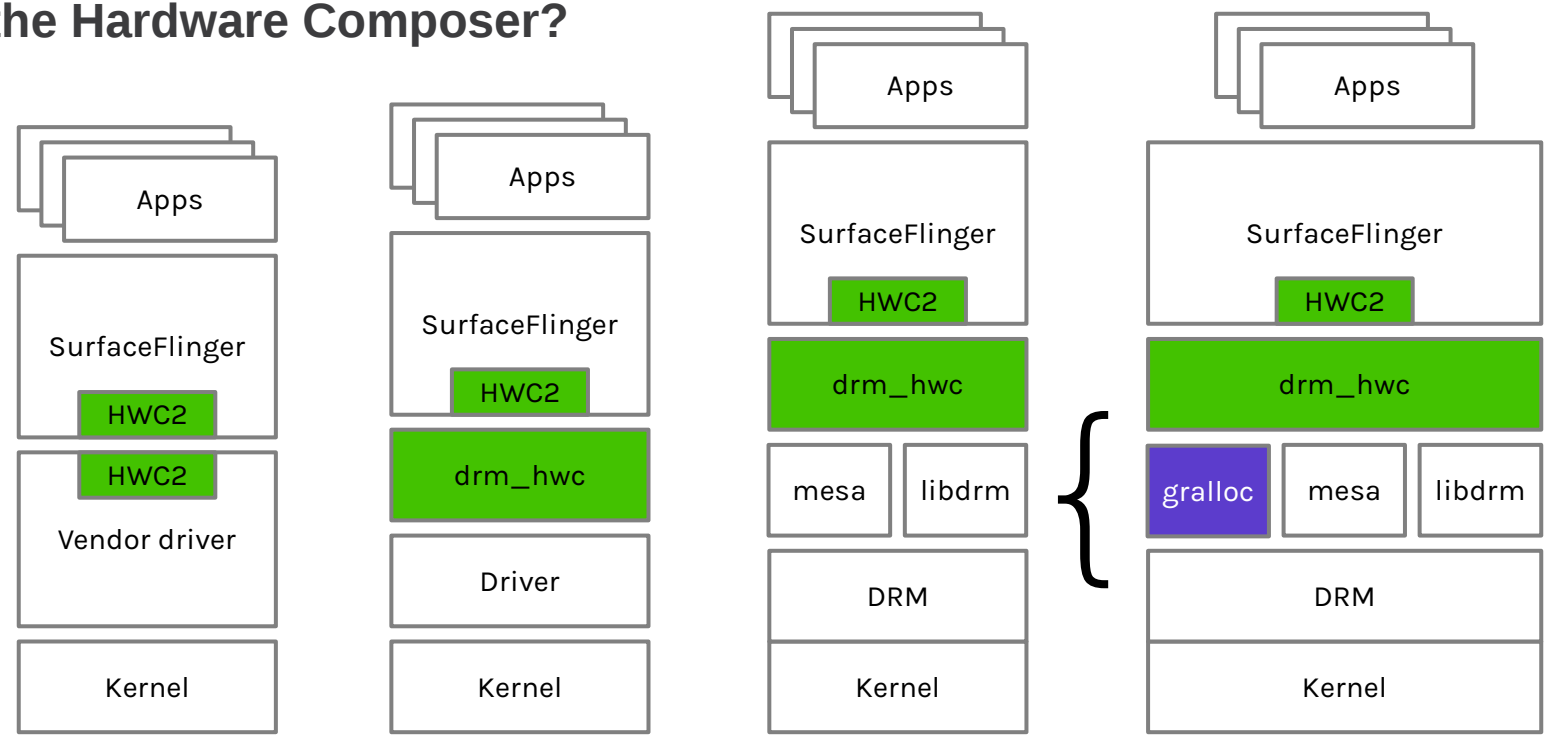

drm_hwcomposer

What is HWC2?

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- Android added buffer Fence support

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  - Ensures ordering between operations

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drm_hwcomposer

What is HWC2?

- Android added buffer Fence support
  - Ensures ordering between operations
  - Synchronizes buffer sharing

drm_hwcomposer

What is HWC2?

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- HWC version 2 is improved using Fences

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drm_hwcomposer

What is HWC2?

- Android added buffer Fence support
- HWC version 2 is improved using Fences
- Mainline received Fence support

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drm_hwcomposer

What is HWC2?

- Android added buffer Fence support
- HWC version 2 is improved using Fences
- Mainline received Fence support
- drm_hwcomposer implemented HWC2

drm_hwcomposer

Project Hosting

- Previously hosted within ChromiumOS

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drm_hwcomposer

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drm_hwcomposer

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  - Thanks Google:
    - Sean Paul
    - Puneet Kumar
    - Marissa Wall

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drm_hwcomposer

Project Hosting

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- Contribute at gitlab.freedesktop.org

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Current Status

Current status

Tested platforms

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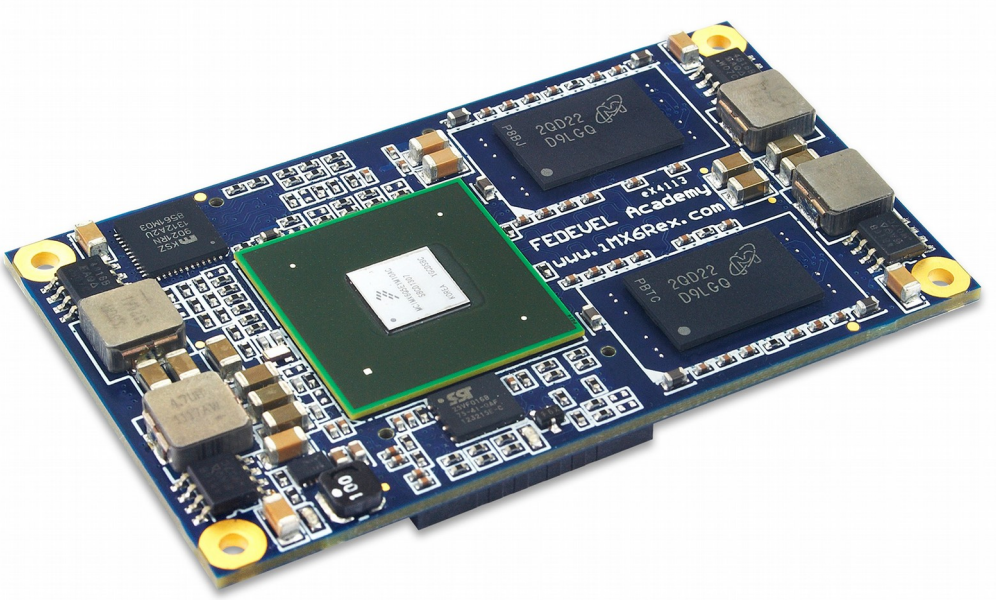
Current status

Tested platforms

- iMX6
  - GPU: Vivante GC3000



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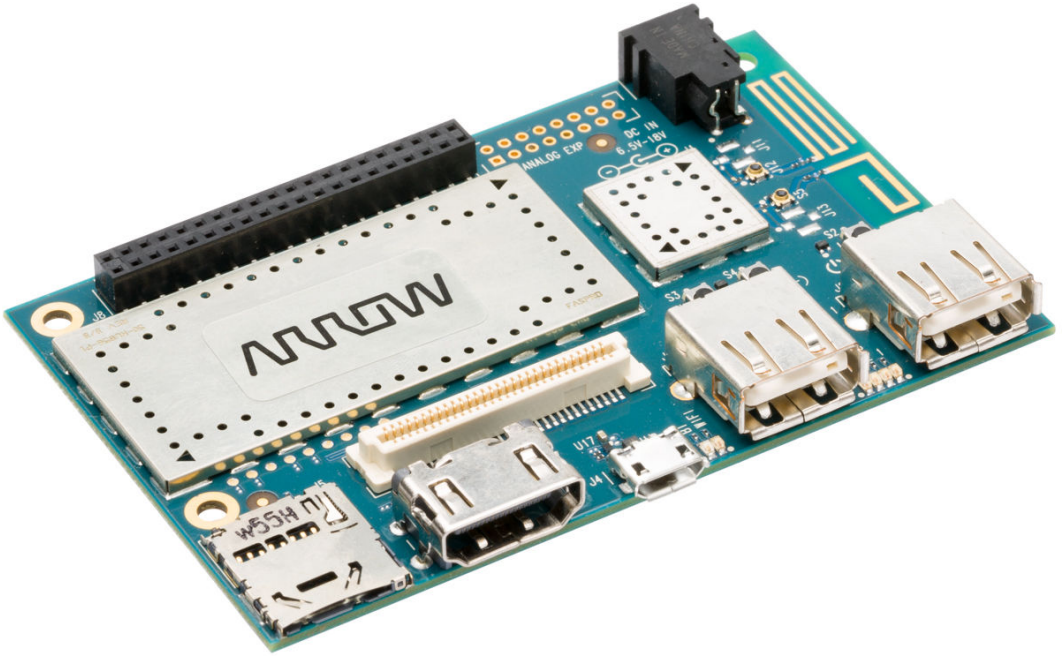
Current status

Tested platforms

- Dragonboard 410c
  - GPU: Adreno 306



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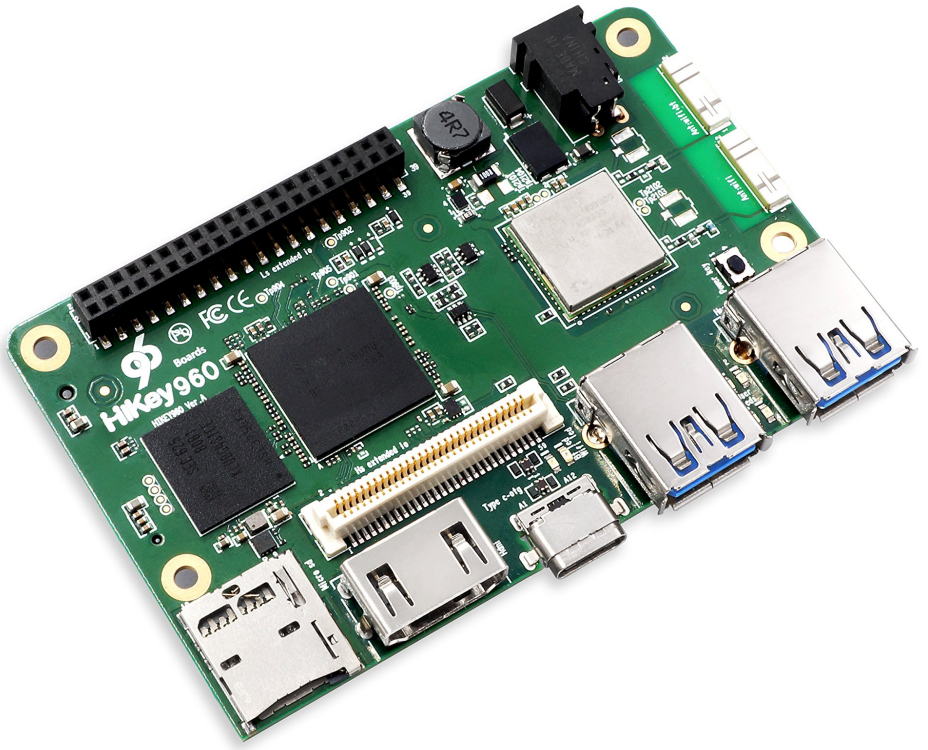
Current status

Under Development

- HiKey 960
  - GPU: Mali G71



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Big Picture

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Merging Android Features

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- A new feature is introduced in Android

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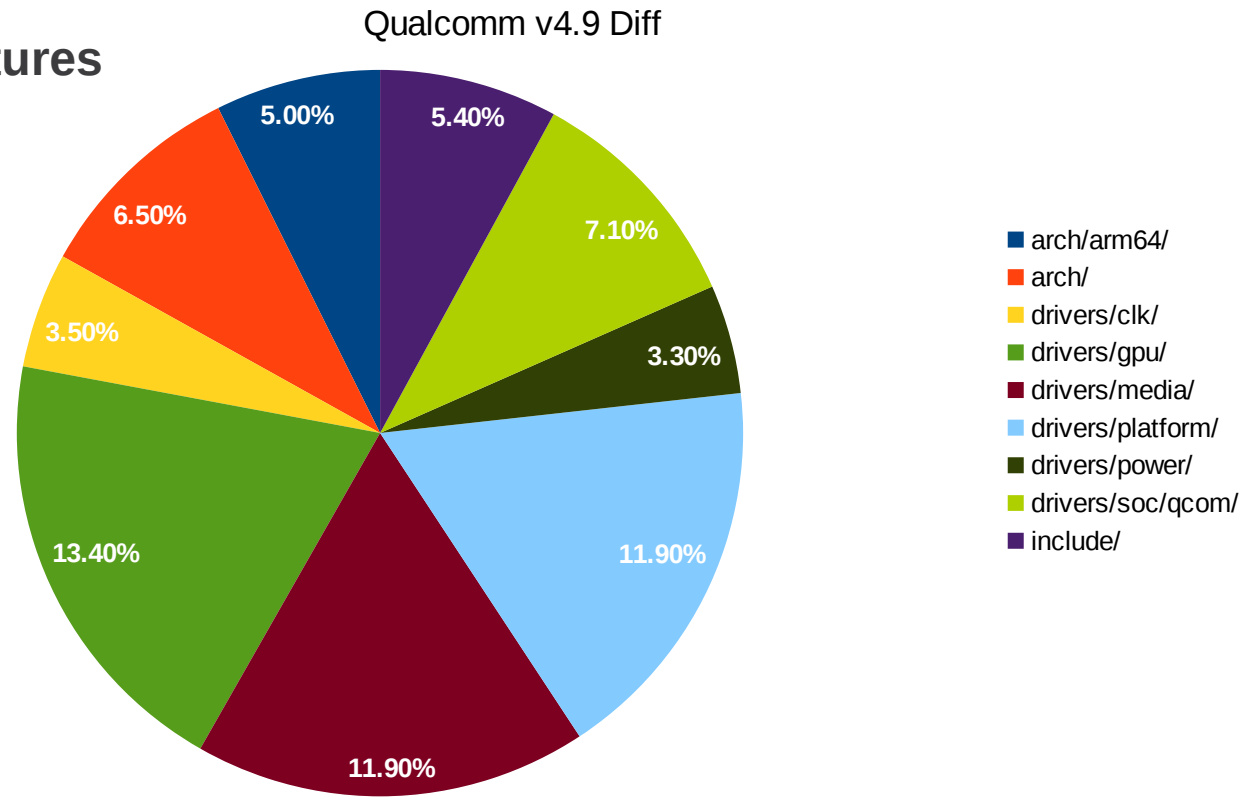

Big Picture

Merging Android Features

- A new feature is introduced in Android
- Slowly migrated into the kernel
- This does not to apply to all subsystems
- The diff size for drivers seem fairly constant

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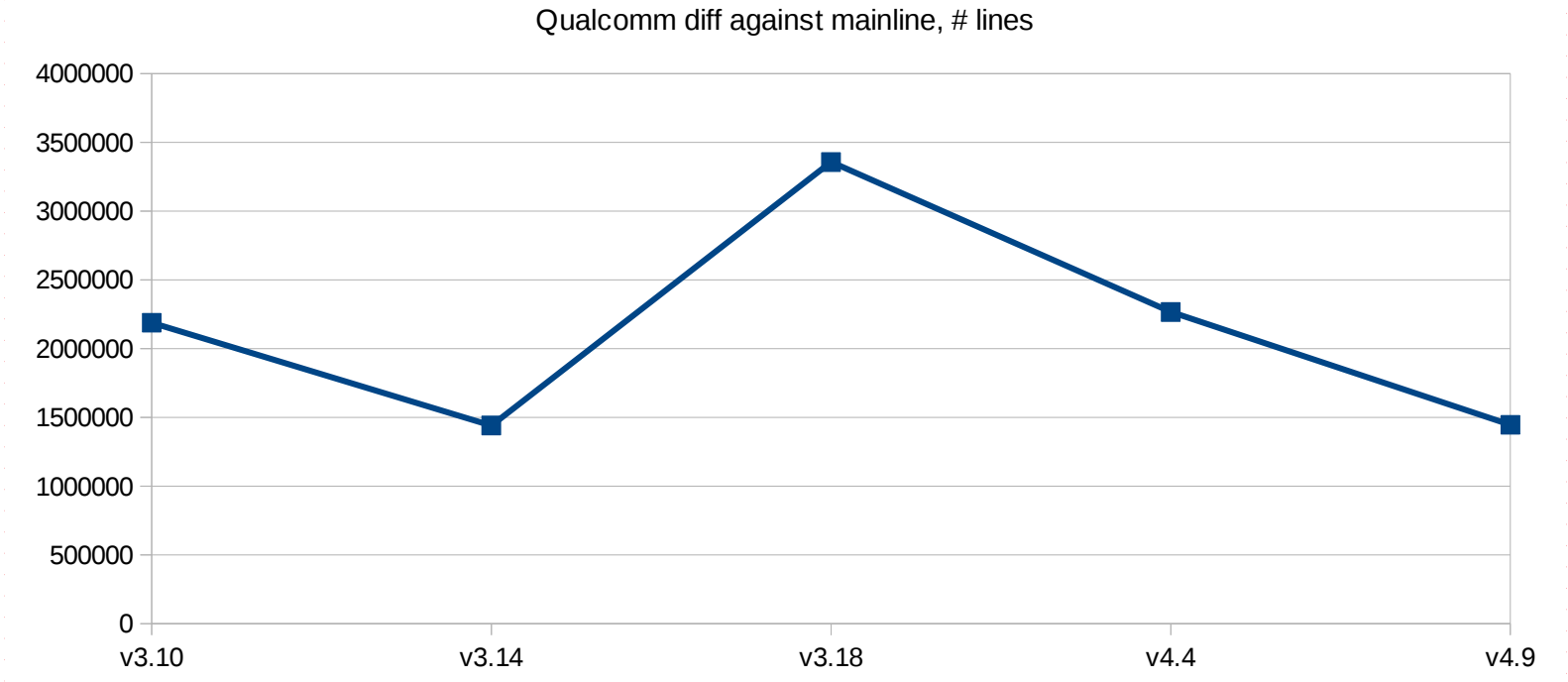
Big Picture

Merging Android Features



Big Picture

Push industry towards Open Source

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- Increase device development speed

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Big Picture

Push industry towards Open Source

- Increase device development speed
- Lower driver development costs

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- Increase device development speed
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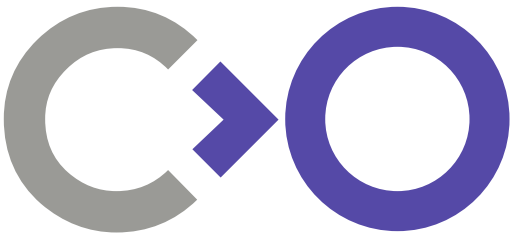
- Increase driver quality

Big Picture

Push industry towards Open Source

- Increase device development speed
- Lower driver development costs
- Increase driver quality
- Push Open Source adoption forward



Thank you!

@memcpy_io