Qualcomm

San Diego

10/19/2023

Supporting Solid Fill Planes

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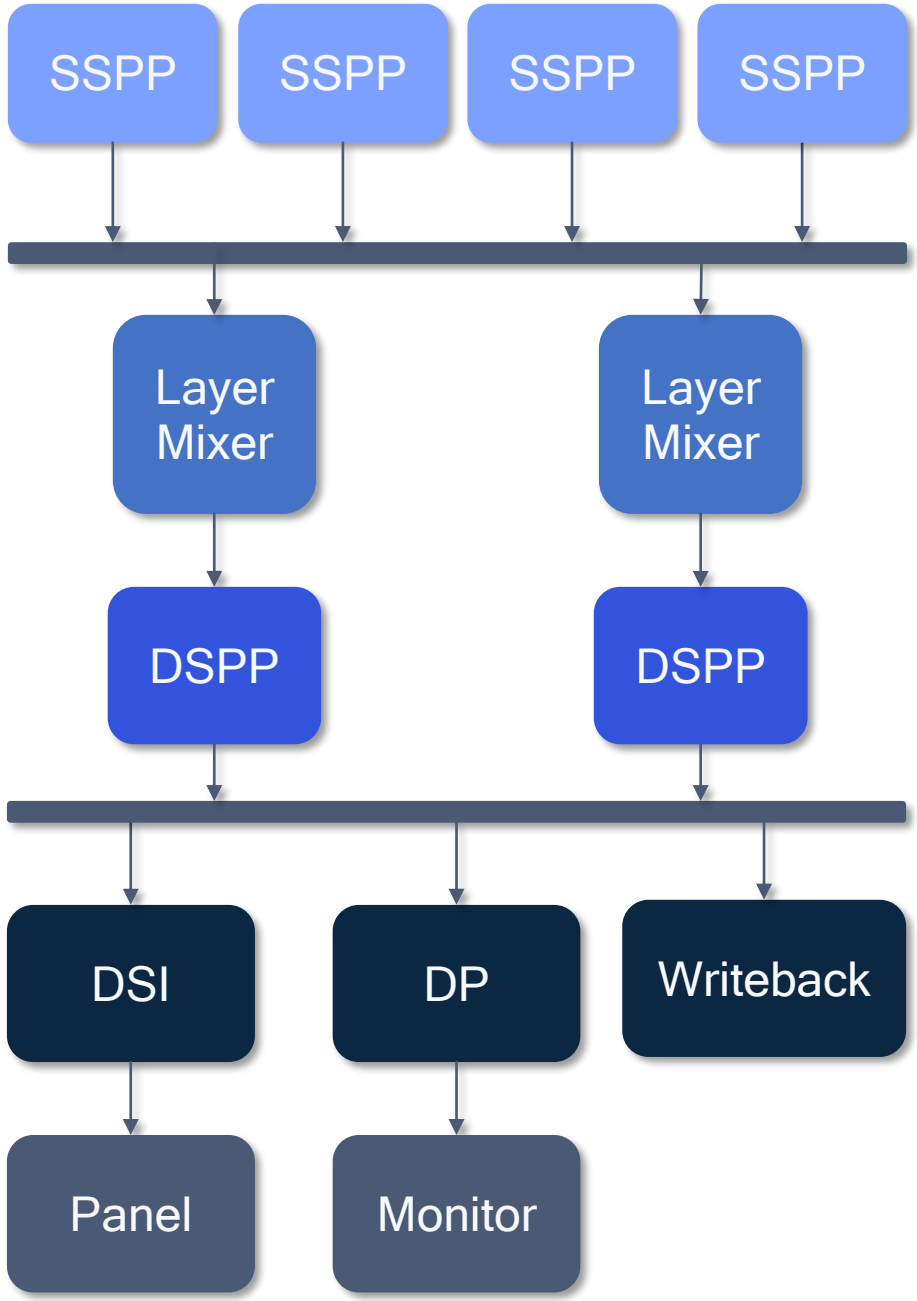
Background

MSM DPU HW Blocks



Background

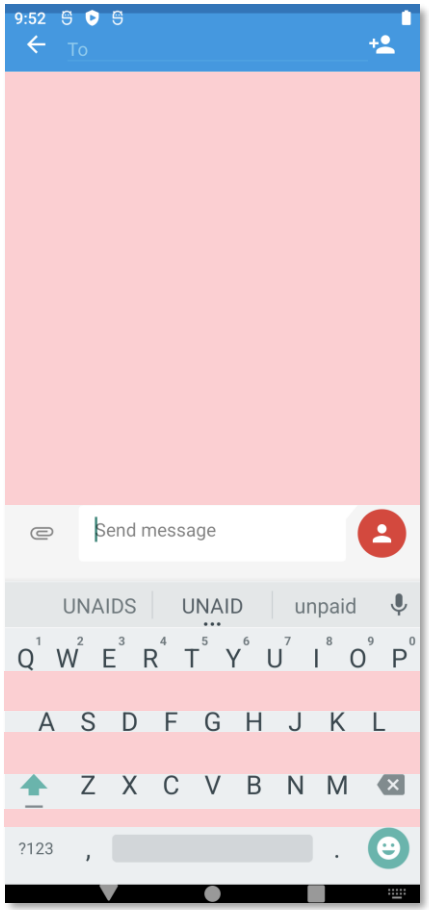
Android HWC HAL SOLID_COLOR Hint

```
/**
 * The device must render this layer using the color set through
 * setLayerColor. If this functionality is not supported on a layer
 * that the client sets to SOLID_COLOR, the device must request that
 * the composition type of that layer is changed to CLIENT upon the
 * next call to validateDisplay.
 *
 * Upon validateDisplay, the device may request a change from this
 * type to CLIENT.
 */
SOLID_COLOR = 3,
```

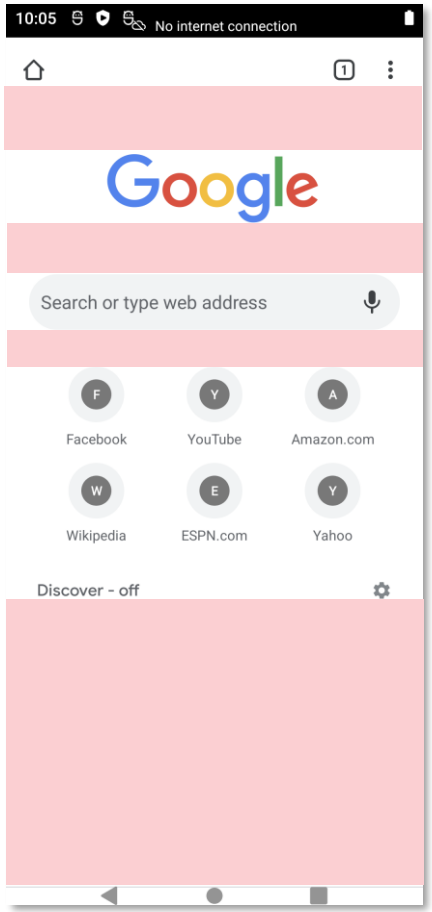
```
Display 4630947039571902851 (active) HWC layers:
-------------------------------------------------------------------------------------------------------------------------------------------------------------------
 Layer name
           Z |  Window Type |  Layer Class | Comp Type |  Transform |   Disp Frame (LTRB) |          Source Crop (LTRB) |     Frame Rate (Explicit) (Seamlessness)
           [Focused]
-------------------------------------------------------------------------------------------------------------------------------------------------------------------
 Letterbox - bottom#136
  rel -20000 |            0 |            0 | SOLID_COLOR |          0 |    0 2009 1080 2400 |    0.0    0.0    0.0    0.0
  |                                        [ ]
-------------------------------------------------------------------------------------------------------------------------------------------------------------------
 com.quicinc.fullscreenapp/com.quicinc.fullscreenapp.FullscreenActivity#150
  rel      0 |            1 |            0 |     DEVICE |          0 |    0    0 1080 2009 |    0.0    0.0 1080.0 2009.0
  |                                        [*]
-------------------------------------------------------------------------------------------------------------------------------------------------------------------
 ScreenDecorHwcOverlay#62
  rel      0 |         2024 |            0 | DISPLAY_DECORATION |          0 |    0    0 1080 2400 |    0.0    0.0 1080.0 2400.0
  |                                        [ ]
-------------------------------------------------------------------------------------------------------------------------------------------------------------------
```

Background

Downstream Power Numbers



Messenger



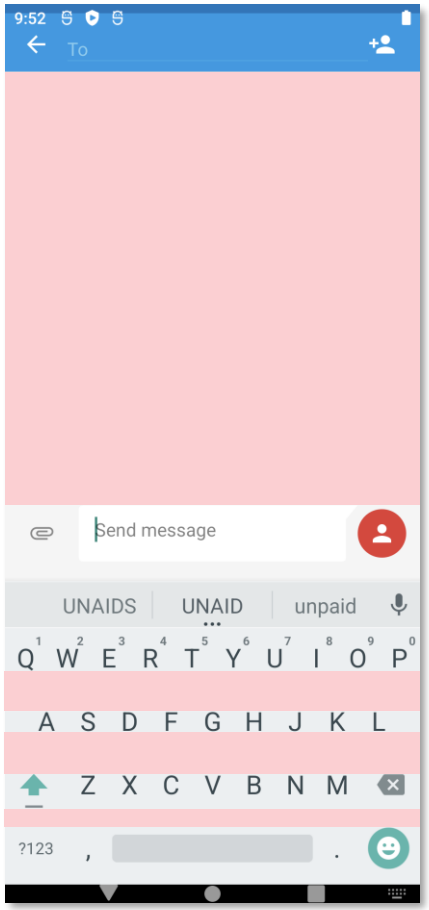
Google Chrome

Power Usage

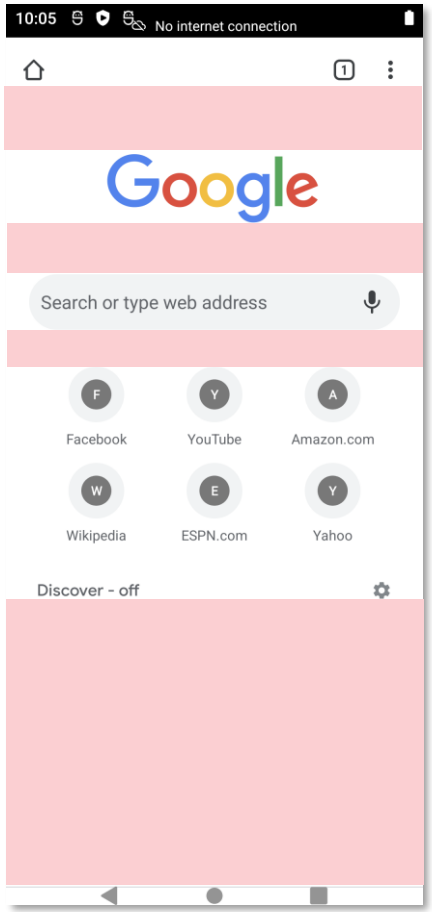
Use Case	DDR Power		Memory Bus Traffic	
	I (mA)	*Power (mW)*	*I (mA)*	*Power (mW)*
Messenger	99.07	113.74	645.57	604.9
Messenger-split	69.23	77.6	618.56	576.06
Chrome	74.82	85.23	622.11	580.33
Chrome-split	70.12	78.84	615.46	574.08

Background

Downstream Power Numbers



Messenger



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Implementation

DRM uAPI Changes

- New DRM properties
  - `pixel_source` - enum property
  - `solid_fill` - blob property
- Pixel sources
  - `DRM_PIXEL_SOURCE_NONE`
  - `DRM_PIXEL_SOURCE_FB`
  - `DRM_PIXEL_SOURCE_SOLID_FILL`
- Solid Fill blob
  - Takes RGB323232 color
- Loosen DRM atomic checks

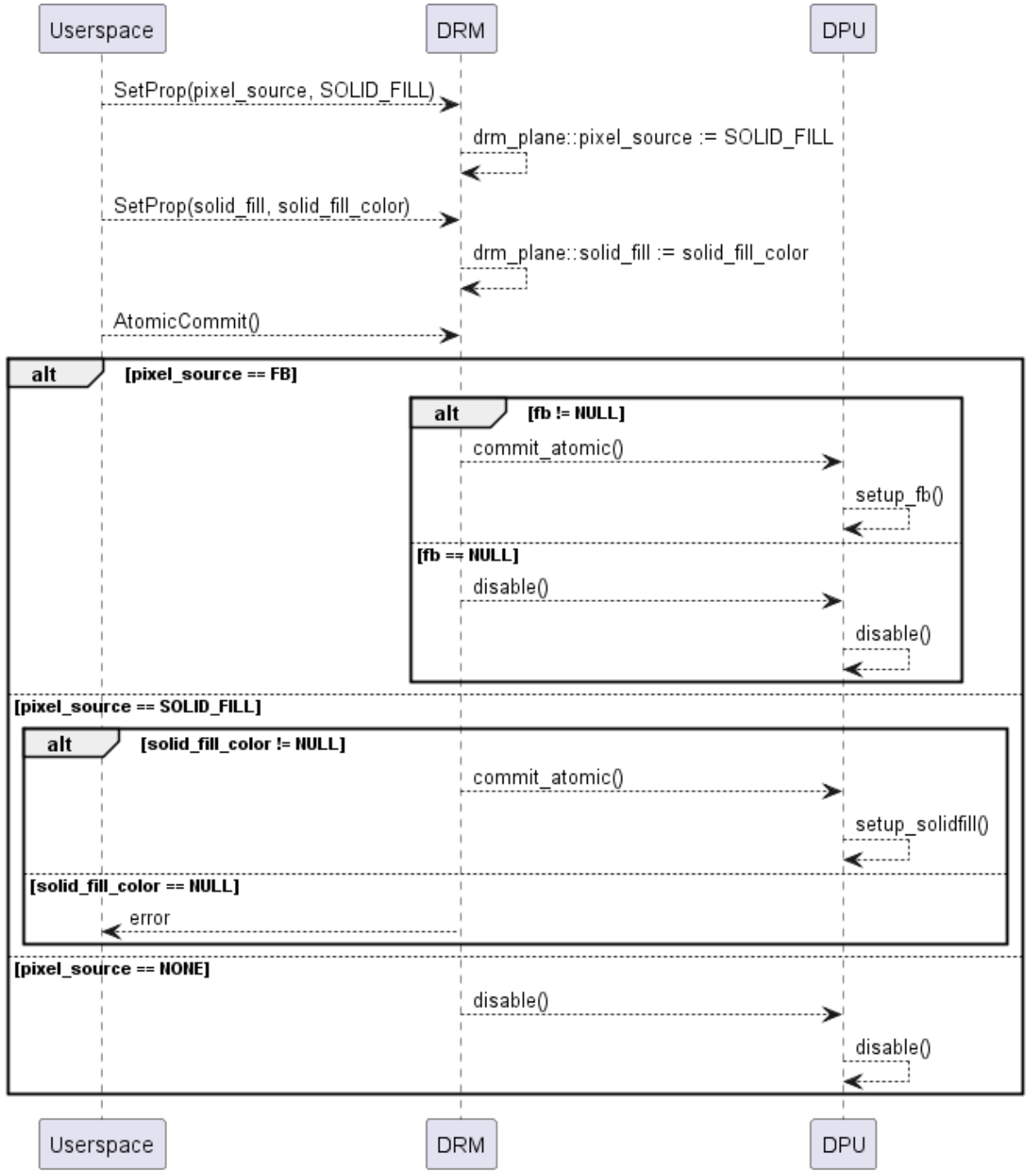
Support for Solid Fill Planes

Submitted by Jessica Zhang on Oct. 28, 2022, 10:59 p.m.

#	Name	TC	A	F	R	T
01	[RFC,v6] drm: Introduce pixel_source DRM plane property	2	2			
02	[RFC,v6] drm: Introduce solid fill DRM plane property	2				
03	[RFC,v6] drm: Add solid fill pixel source	1	1		1	
04	[RFC,v6] drm/atomic: Add pixel source to plane state dump	1			1	
05	[RFC,v6] drm/atomic: Add solid fill data to plane state dump	2			1	
06	[RFC,v6] drm/atomic: Move framebuffer checks to helper	0			1	
07	[RFC,v6] drm/atomic: Loosen FB atomic checks	4				
08	[RFC,v6] drm/msm/dpu: Allow NULL FBs in atomic commit	1			1	
09	[RFC,v6] drm/msm/dpu: Use DRM solid_fill property	1			1	
10	[RFC,v6] drm/msm/dpu: Add solid fill and pixel source properties	0			1	

Implementation

Sequence Diagram



References

Further Reading

- Solid Fill Patch Series
  - Patchwork: https://patchwork.freedesktop.org/series/110283/
  - Email archive: https://lists.freedesktop.org/archives/freedreno/2023-August/027950.html
- Qualcomm Developer's Network Blog
  - https://developer.qualcomm.com/blog/how-reduce-power-consumption-qualcomm-displays-using-solid-fill-planes

Thank you

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