# 2025 Display Next Hackfest Update

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# Agenda

- About the Display Next Hackfest
- Participants
- HDR
- Commit Failure Feedback
- Backlight Improvements
- VRR for Desktop
- Pageflip timeouts
- Real-time Scheduling
- Outings, Drinks, Food, Conversation

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# Display Next Hackfest

- Unconference format

- Brings together **display driver** and **compositor** developers and maintainers

- Goals
  - Keep moving
  - Align on designs
  - Identify and deal with pain points
  - Highlight bugs or problems

- No recording
- Jointly created <u>working doc</u>

- Hosted at AMD Markham (near Toronto)

- Previous hackfests organized by Red Hat and Igalia

- Three-day packed sessions

- Local and remote attendance

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# Participants

## Compositors

- Gnome
- KDE
- Weston
- Smithay
- Sway / wlroots
- ChromeOS

## HW Vendors

- AMD
- Intel
- ARM
- Raspberry Pi

## Others

- VKMS
- IGT
- DRM CI
- LittleCMS
- Color Scientist

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# HDR – Compositors & Apps

## Wayland Protocols Merged

- Color management
- Color representation

## Compositors with HDR support

- mutter
- kwin
- weston

## Applications with HDR support

- gamescope
- mpv
- Blender
- Firefox WIP - (gfx.wayland.hdr=true)
- Chromium WIP

## Discussions and Challenges

- Vulkan vs Wayland Reference Luminance
- Blending
- Composing SDR and HDR content
- Viewing Environment Adjustments

## Notes

- Color & HDR – Status
- Color & HDR – Q&A
- Color & HDR – Compositors & Applications

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# HDR – HW Composition

## Pre-blending Color Pipeline

- DRM core, VKMS, and amdgpu
- Intel implementation based on this
- Reviewed and ready to merge
- Now only advertising relevant properties based on client cap

## IGT patches

- Need more review

## Userspace

- Kwin - Xaver Hugl
- Weston - Leandro Ribeiro

## Post-blending Color Pipeline - Nicolas F. R. A. Prado

- Based on pre-blending color pipeline
- Implementation for Mediatek driver
- IGT Tests

## Next Steps

- Merge pre-blending pipeline
- Color-space conversion color for YUV buffers
- Inverse EOTF precision

## Inverse EOTF precision

- Segmented LUTs
- Inverse LUT definition
- Dual-LUT
  - 1st LUT defines input points
  - 2nd LUT defines values (output points)

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# Backlight Improvements

## Problem Statement

- Backlight is controlled via sysfs
- There is no way to correlate backlight device with connector

## Proposed Solution

- Add backlight connector properties to drm_connector

## Progress

- Mario Limonciello has been working on this

## Future Work

- Explore whether backlight can be set atomically
- Explore whether backlight can be specified in nits (cd/m$^2$)

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# Commit Failure Feedback

## Problem Statement

- Compositors have no information why atomic commits fail
- Compositors need to guess
- Fallback to sub-optimal solutions

## Proposed Solution

- Start with simple stuff
- Keep it expandable for the future
- Enum to show the problem
- String with "verbose" info for logging by compositor
- Optionally: array of KMS object IDs

## Enum values

- Undefined
- Scanout Bandwidth
- Scanin Bandwidth
- Connector Bandwidth
- Memory Domain
- Spec Violation (out of range, immutable, -EINVAL)

## Progress

- User readable error codes on atomic_ioctl failure - Arun R Murthy

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# Pageflip Timeouts

## Problem Statement

- Some hard-to-reproduce driver bugs lead to pageflip timeouts
- Since compositor doesn't get an event it hangs
- User has to force reboot

## Possible solutions

- DRM already knows a page-flip timeout occurs
- DRM sends a pageflip_timeout event instead
- DRM calls driver callback to attempt recovery
- Compositor issues a full modeset to reprogram

## Progress

- None (that I'm aware of)

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# Real-Time Scheduling

## Problem Statement

- Compositor wants to schedule its composition step as late in the frame as possible

- This reduces latency

- It needs to know when the deadline is and get feedback on how long driver programming takes

## Progress

- <u>Add atomic commit HW done event & deadline property</u> - Michel Dänzer

- Adds hw_done event

- Adds deadline property

- Assumes deadline doesn't change between modesets

## Proposed Solution

- Report hw_done event up to userspace

- Report time until HW latches with the event

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# VRR for Desktop

## Problem Statement

- Enabling lower or variable refresh rate on desktop can save power

- We might want to target a fixed refresh rate when video playback is the main focus, or even for frame-limited games

## Proposed Solution – DRM

- Client cap that compositor can manage VRR

- Driver disables any low-frequency-compensation, etc., upon seeing this

- New properties for VRR min/max

- Driver simply programs HW to provided VRR min/max values

## Proposed Solution – Wayland

- A new protocol that allows applications to communicate a preferred refresh rate

- Compositors can decide whether to target it based on their own heuristics

## Progress

- drm/uapi: Indroduce a VRR Range Control Interface – Chuanyu Tseng

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# Other Topics

- Async Pageflip Failures

- DP AUX Improvements

- Per-CRTC Page-flip Event Requests

- Superframes

- 2D Composition Engines

- Desktop Testing Framework

- DRM CI

- VKMS Improvements

- VRR Bugs

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# Outings, Drinks, Food, Conversation

- It can be easier to get things done virtually after socializing in real life
- We're human beings and we care about connecting with other human beings

Trip to the CN Tower

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# Hackfest 2026
## ???

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