Linaro connect
Bangkok 2016

Graphics Stack Update

Presented by

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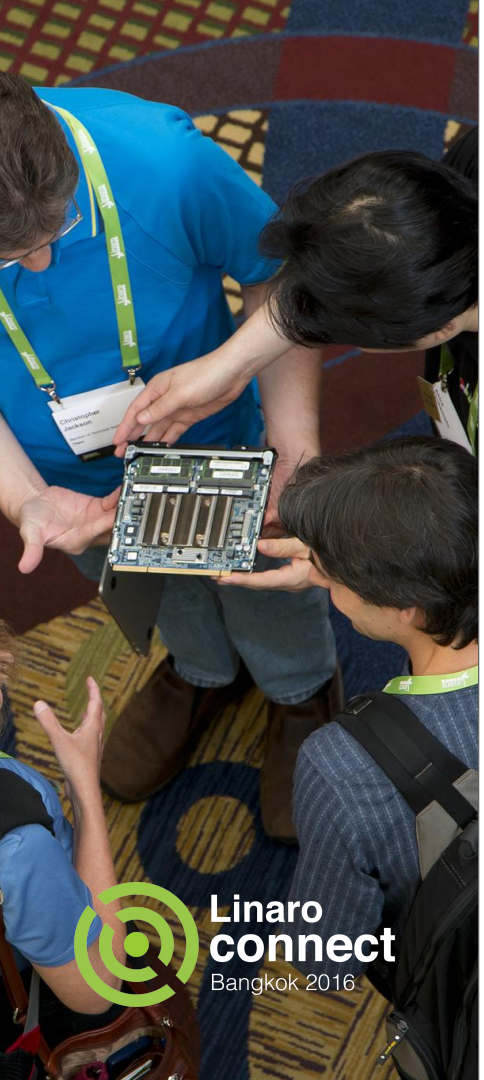
Event

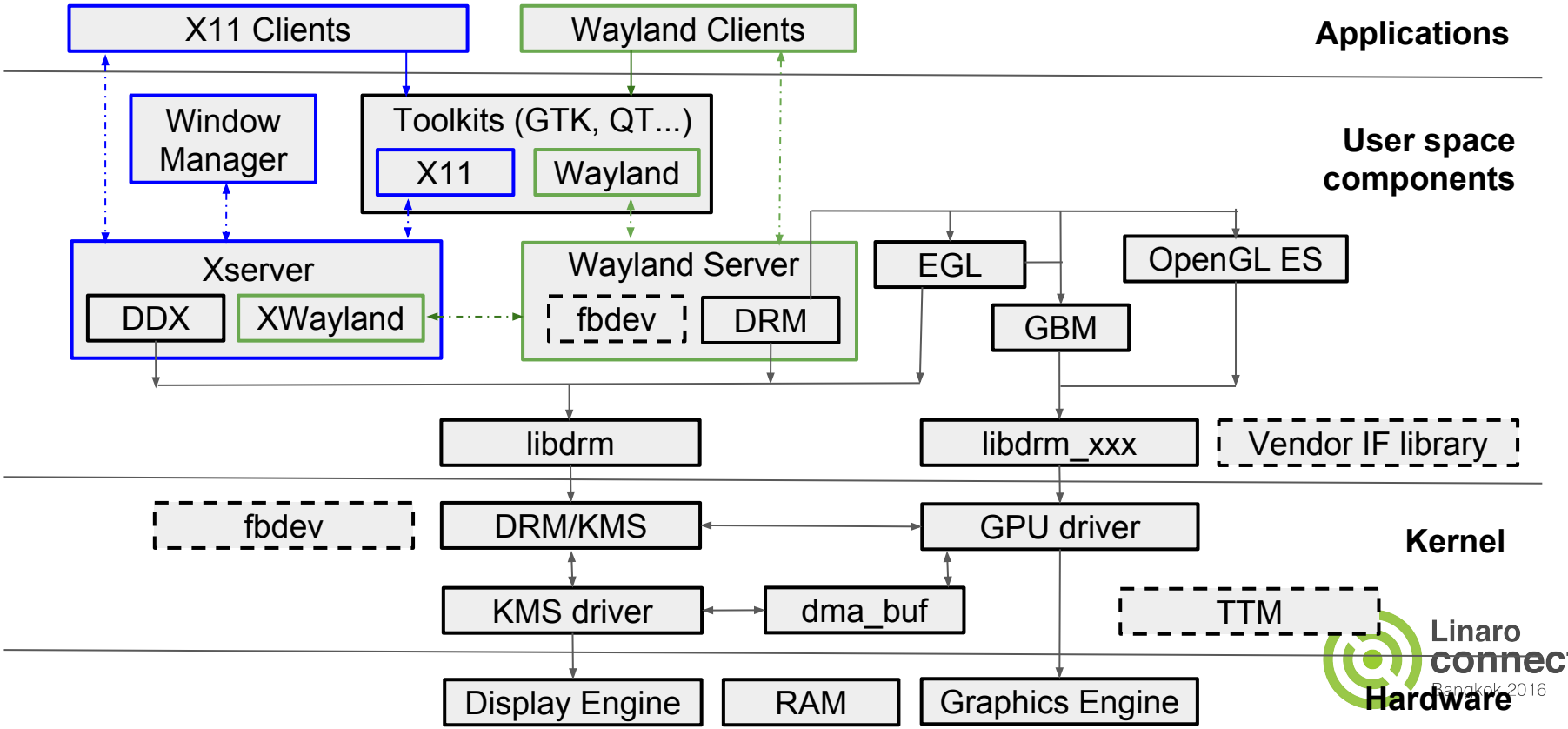
BKK16



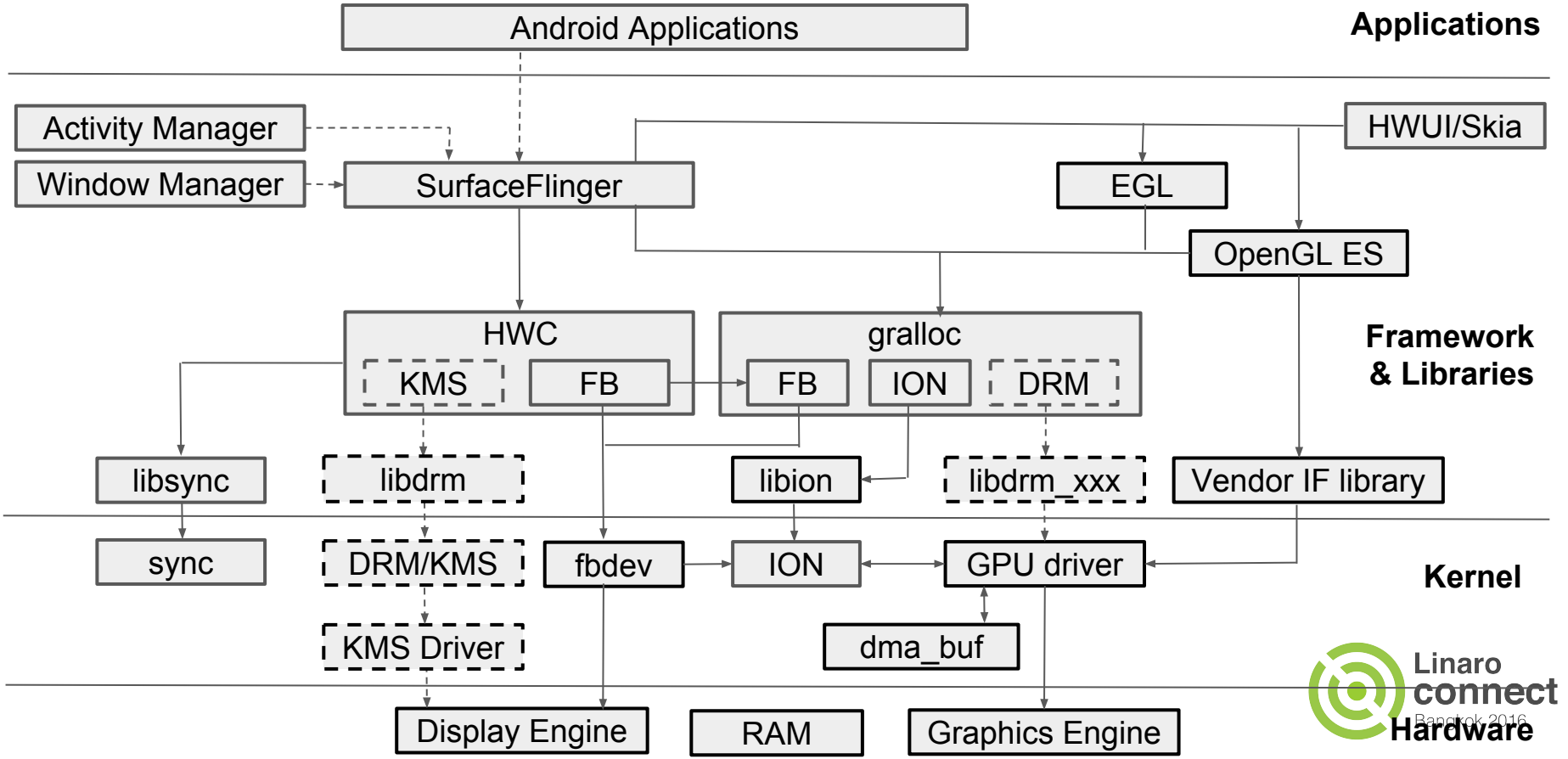
Agenda

- X11/Wayland/Android graphics overview
- Mali and Adreno driver status
- Linaro effort around graphics
- Discussion and Q&A

Wayland/X11 Graphics Architecture



Android Graphics Architecture



Mali Driver Status

- **Proprietary driver from ARM**
  - Open source components
    - Kernel mode driver
    - UMP user space library
    - DDX driver (xf86-video-mali, fbdev/UMP based, ***no 2D HW acceleration***)
    - Gralloc
  - Binary user space drivers
    - EGL (DRI2 based for X11)
    - OpenGL ES (ES3.1 support only for Midgard)
    - OpenCL and Renderscript (Midgard only)
    - ***No GLX and OpenGL support***
    - ***DDK r5p1 or newer should be used for Wayland***
- **Open source driver from community (lima and tamil)**

Adreno Driver Status

- **Proprietary driver from Qualcomm**
  - Open source components
    - Kernel mode driver (kgsl)
    - xf86-video-msm DDX driver
  - Binary user space drivers (EGL, OpenGL ES, Renderscript, OpenCL, gralloc, etc)
- **Open source driver from community (freedreno)**
  - Kernel mode driver (msm.ko)
    - First merged in kernel 3.12 for Adreno 2xx/3xx support
    - Adreno 4xx support added in kernel 3.19
  - libdrm_freedreno (support both msm and kgsl kernel mode drivers)
  - mesa/gallium (msm_dri.so)
    - OpenGL 3.1 and OpenGL ES3.0 for A3xx/4xx (OGL 1.4 and ES2.0 for A2xx)
    - ***No OpenCL support***
  - xf86-video-freedreno DDX driver (support both fbdev and KMS display driver)
    - 2D HW acceleration with XA state tracker of Gallium

LHG - Wayland and Android

- Wayland/weston enablement on member platforms
- Metrological WPE (WebkitForWayland)
- CEF support in Linaro RDK (Ozone-Wayland, etc)
- OpenSDK to support V4L2, DRM/KMS, GStreamer and Wayland
- **BKK16-209: Chromium V4L2 playback - is it ready today?**
- **Demo: LHG OE Chr-Wayland/Weston on DB & HiKey**

LMG - Android

- DRM/KMS support for hwcomposer/gralloc
- ION and ADF upstreaming
- GPGPU support (OpenCL, etc)
- **BKK16-202: LMG Lightning Talks**
- **BKK16-403: Android HAL Consolidation Status**

96Boards RPB Support

96Boards (SOC/GPU)	OGL ES	OCL	Linux/X11	AOSP
HiKey (Kirin 620/Mali-450MP4)	2.0	*N/A*	binary	binary
DB410c (Snapdragon 410/Adreno 306)	3.0	*1.1 EP*	freedreno	binary/freedreno
Bubblegum96 (S900/PowerVR G6230)	3.1	*1.2*	binary(*)	binary(*)
Andromeda (IAP140/Vivante GC7000UL)	3.1	*1.2*	binary(*)	binary(*)

(*) to be confirmed

- Mali kernel mode driver is integrated in HiKey Linux RPB (no upstream)
- Kirin 620 ADE KMS driver is integrated in HiKey Linux RPB (upstream is ongoing)
- xf86-video-armsoc is used by HiKey Linux RPB now (no 2D HW accel, dma-buf based)
- The freedreno driver has been enabled for DB410c AOSP RPB
- The wayland/weston support will be enabled soon for OE/Yocto Linux RPB as well as Debian Linux RPB (once there is good driver support)
- OpenCL is not supported yet in the RPBs

Discussion

- Wayland/X11
  - GBM library for DRM backend of weston (decouple gbm from mesa or use minigbm?)
  - Mali DDK support for GBM and Wayland platforms (similar for other proprietary drivers)
  - More advanced wayland display servers enablement on ARM (gnome-shell, kwin, etc)
  - Toolkits/apps porting and optimization on ARM (GNOME, QT, SDL, gstreamer, etc)
  - Xwayland support with xf86-video-modesetting and glamor
- APIs
  - Vulkan
  - OpenCL/OpenVX/OpenCV
  - GLVND for Linux
- Use cases
  - VR/AR, AI and deep learning, wearables and IoT, etc
- Other
  - GPU virtualization (VirGL renderer support from QEMU 2.5/Mesa 11.1/kernel 4.4)
  - Discrete graphics card support on ARM platform

Vulkan briefing

- New API spec from Khronos for graphics and compute, unified for desktop, mobile, console and embedded
- Vulkan 1.0 announced on Feb 16th together with WSI extension and SPIR-V
- Designed to be implementable on hardware with OpenGL ES3.1 or OpenGL 4.x capability
  - ARM Mali: Midguard (T6xx/T7xx/T8xx) and later
  - Qualcomm Adreno: 4xx, 5xx and later
  - Imagination PowerVR: Series 6 and later
- More development work to be done for Linux and Android
  - Driver enablement by GPU vendors and community
    - Intel Anvil open source Vulkan driver for mesa is a good reference
    - DRI3 is required for X11 WSI support
    - SPIR-V support, Vulkan synchronization primitives, etc
  - SDK and tools support (LunarG SDK for Linux, etc)
  - Middleware and toolkit support (Qt Vulkan integration, etc)

Q&A

Thanks!