

# Linux Plumbers Conference

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# Efficient memory allocation between different subsystems

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# a.k.a Resurrecting the Unix Device Memory Allocator

[https://www.x.org/wiki/Events/XDC2016/Program/Unix\\_Device\\_Memory\\_Allocation.pdf](https://www.x.org/wiki/Events/XDC2016/Program/Unix_Device_Memory_Allocation.pdf)

James Jones, XDC 2016



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# Problem Statement

- **Buffer allocation:** How does an application allocate image buffers shareable by multiple producers and consumers with optimal performance ?
- **Format negotiation:** How does an application decide on the optimal format (pixel format, modifiers, stride, ...) for the images stored on those buffers ?
- **Cache management:** How do we ensure correctness and performance ?

For the purpose of this high-level discussion, the words “Buffers”, “Buffer Objects”, “Frame Buffers” and “Surfaces” are used interchangeably. These concepts are more precisely defined in different kernel areas and userspace frameworks (with different meanings of course).



# (Mostly) Solved Problems

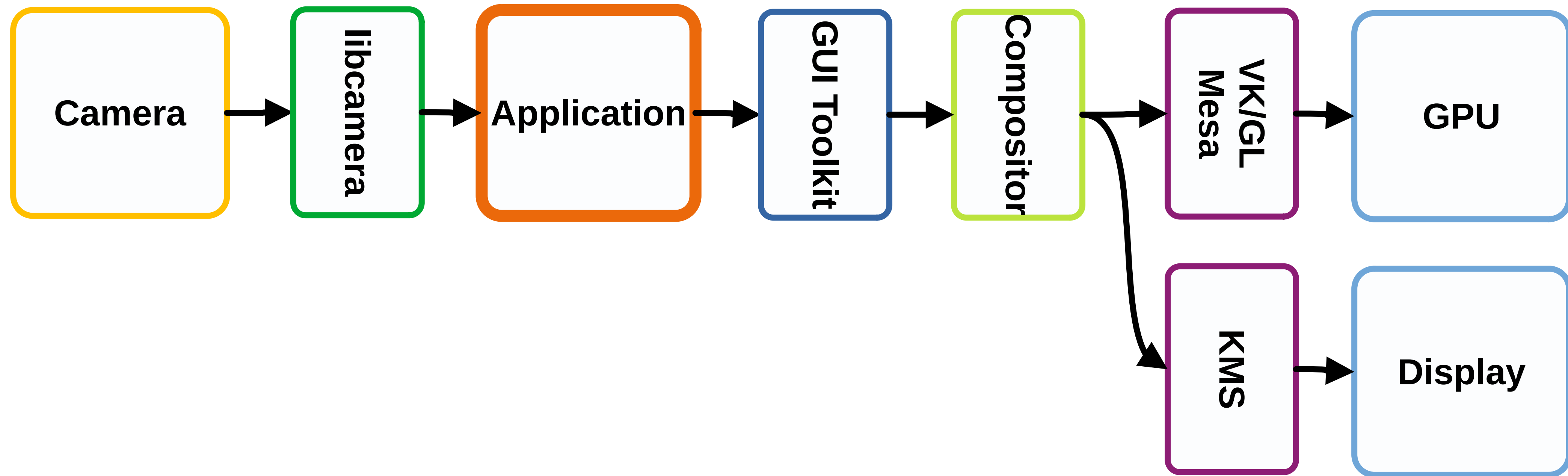
- **Synchronization:** Fence support is there, but not used everywhere (e.g. missing from V4L2).



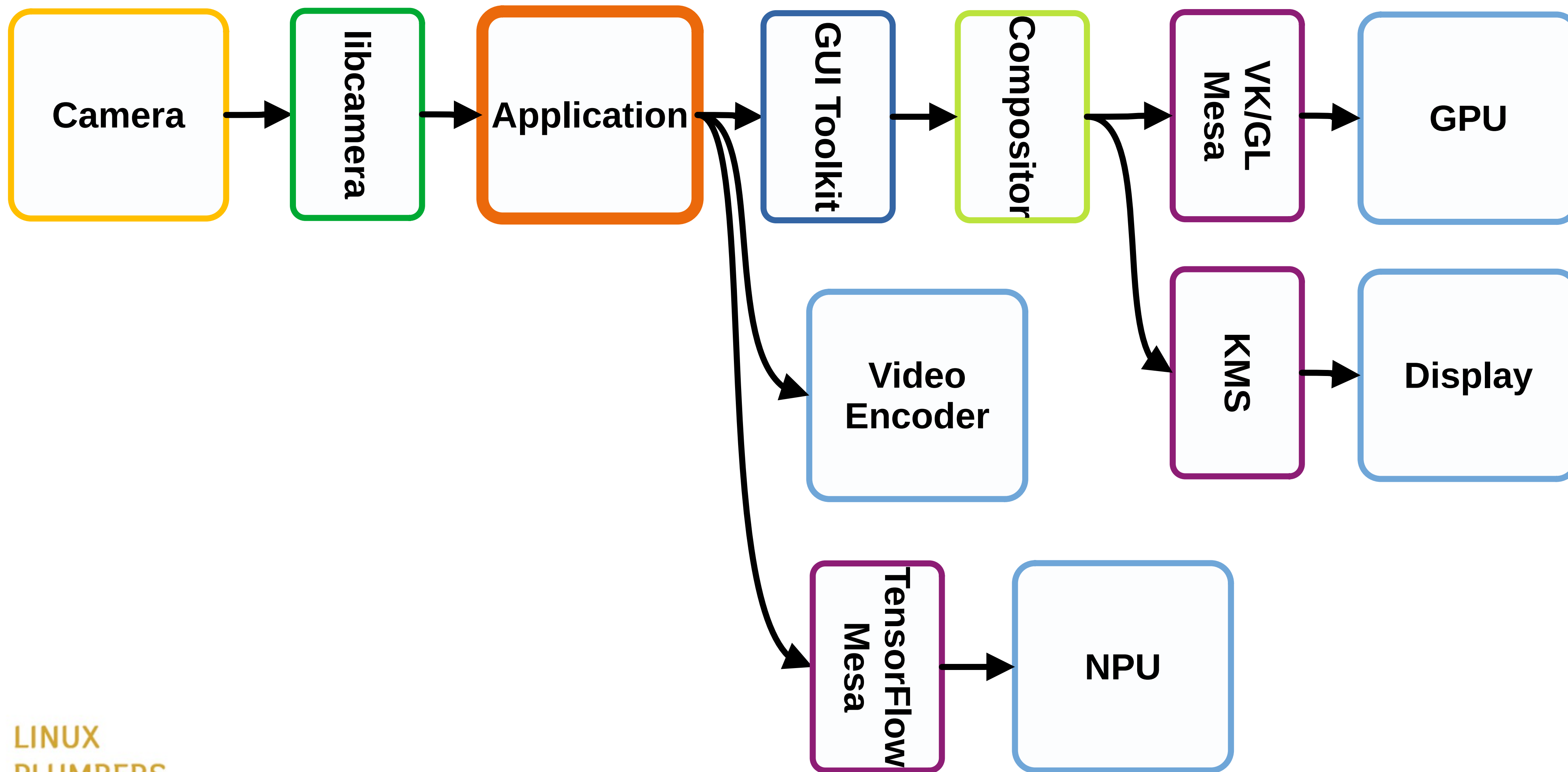
# Use Cases



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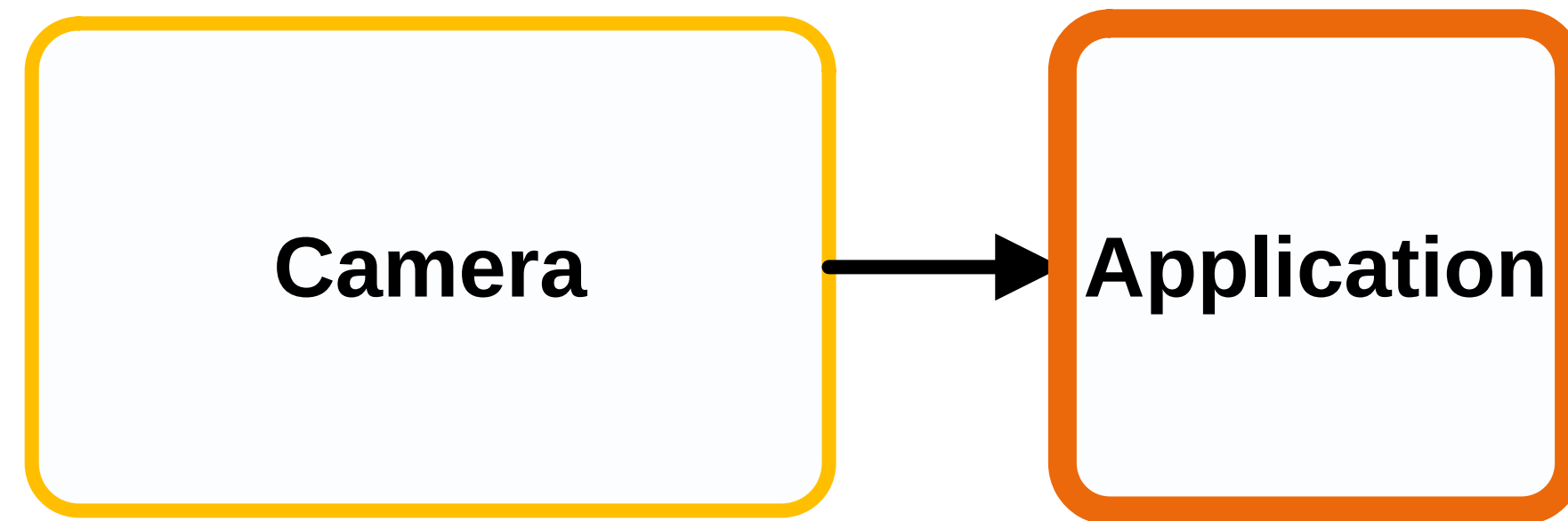


# Use Cases





# Use Cases



# Kernel Buffer Allocation APIs

- Multiple allocation APIs offered by the kernel
  - DRM (driver-specific)
  - V4L2 (generic, driver-specific backend)
  - DMA heaps (user-selectable backend)
  - UDMABUF
  - ...
- Based on standard or driver-specific IOCTLs
- APIs focus on the needs of the device they cater for



# Some Relevant Prior Art in Userspace

- GBM (Mesa) & mini-gbm (Chrome OS)
- Gralloc (Android)
- EGLStream (Khronos)
- Vulkan (Khronos)



# What Next ?

- Who has an interest in seeing this fixed ?
- What parts of the problem space have the highest priority ?
- Who can contribute ?

There will be a session at XDC 2024 (<https://indico.freedesktop.org/event/6/>) on this topic.



# Vielen Danke



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