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Linux Explicit DMA Fences in GStreamer

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Open First

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Overview

- What are DMA Fences ?
- What can be used for ?
- What are the limitations ?
- How could we implement this ?

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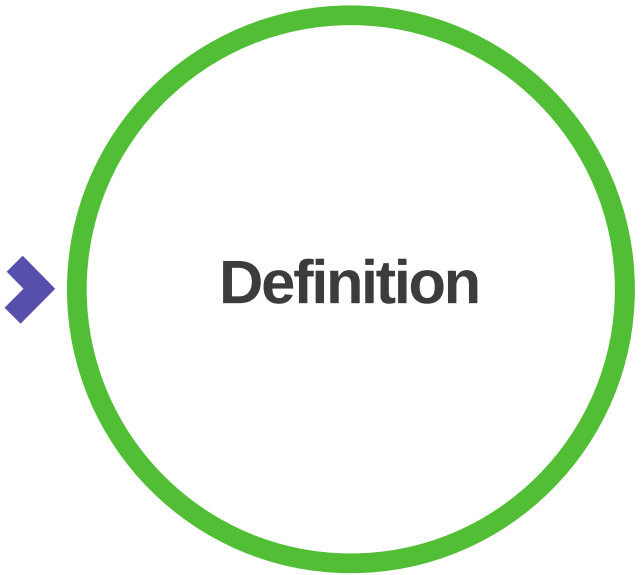
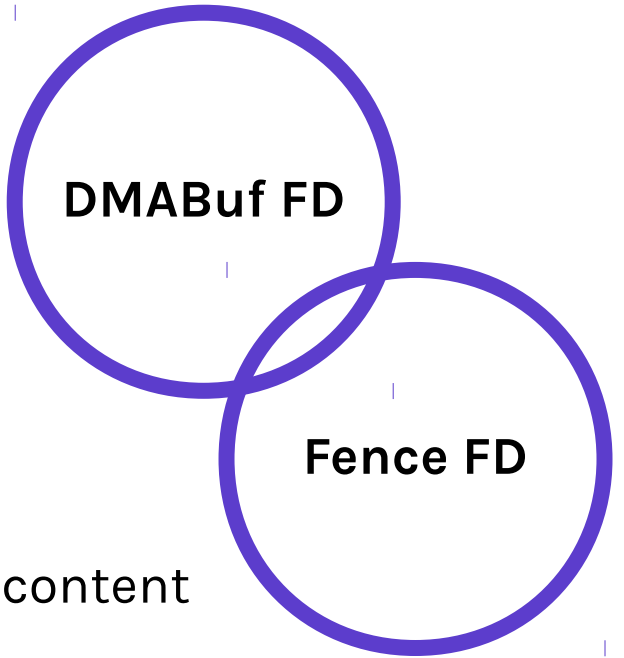
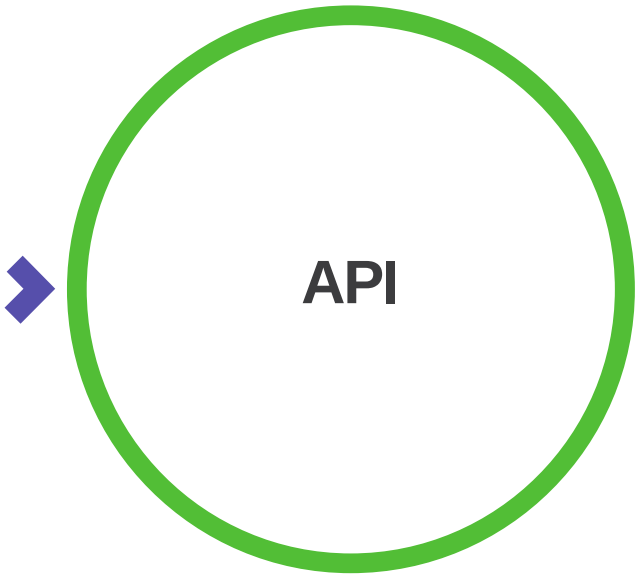
What are DMA Fences ?



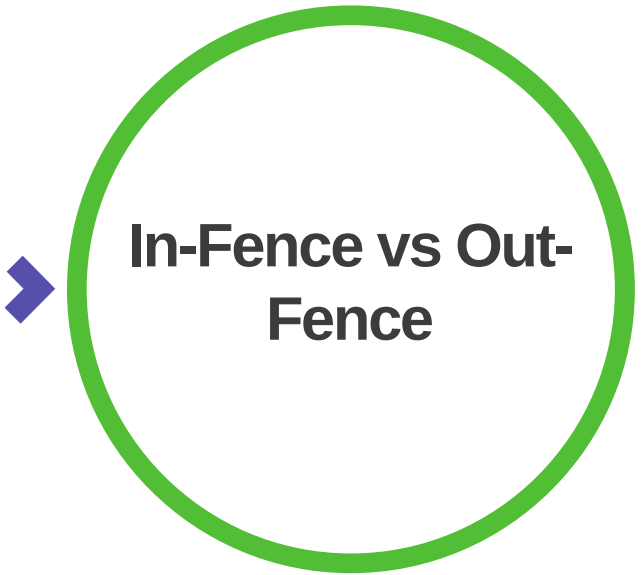
“A mechanism to track asynchronous operation on a buffer”



- Attached to a DMABuf
- Signals when the DMABuf content has been delivered
- Fences can be merged together to wait for several content at once



- **sync_wait (fd, timeout)**
  - poll() / select()
- **sync_merge (fd1, fd2)**
  - ioctl (fd, SYNC_IOC_MERGE, ...)
- **sync_fence_info (fd, info)**
  - ioctl (fd, SYNC_IO_FILE_INFO, ...)



- An In-Fence is a fence that application provide for an operation on a driver
- An Out-Fence is a fence returned by an operation on a driver

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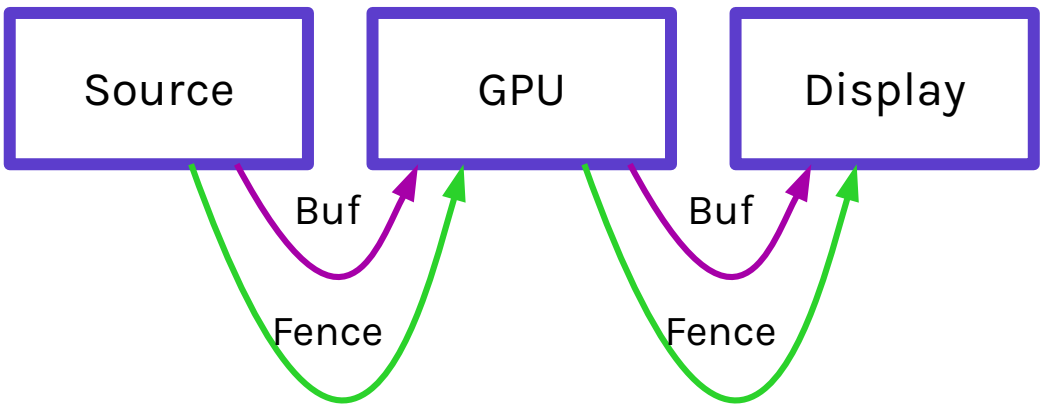
What can be used for ?

Ahead of Time



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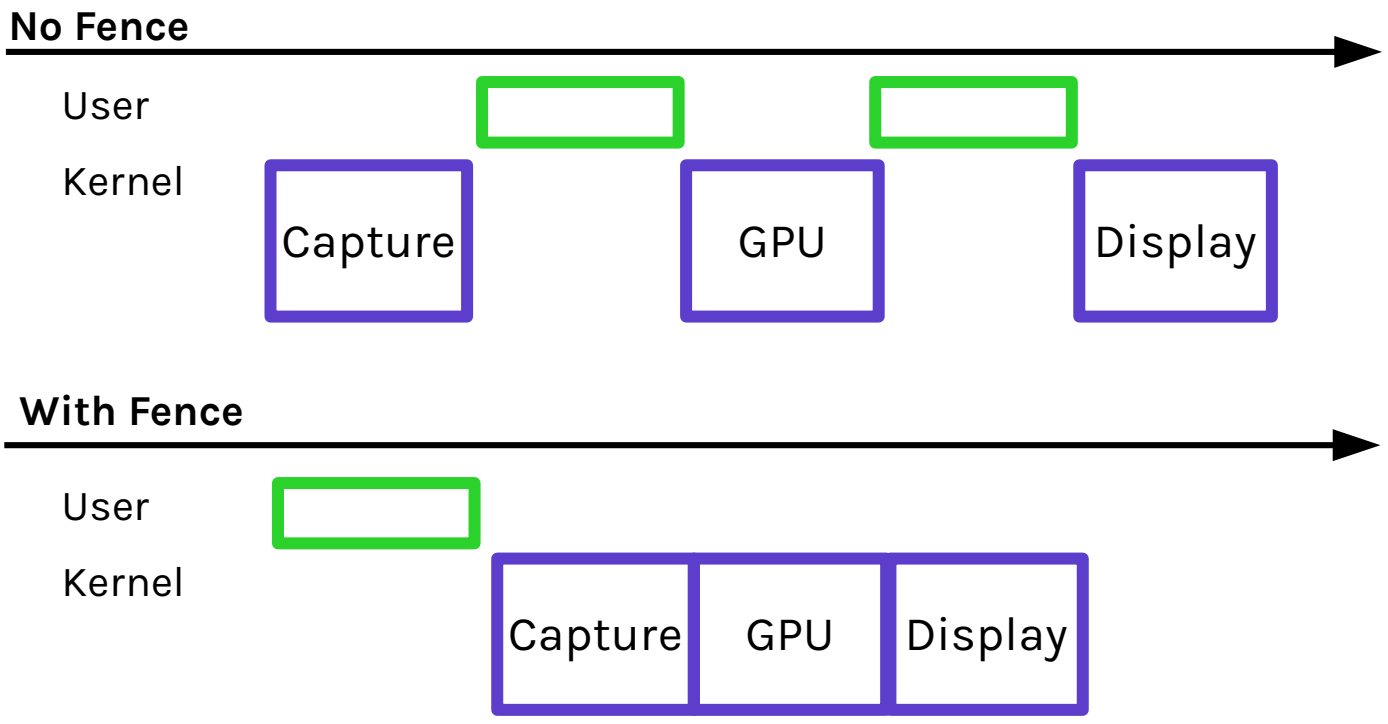
On a Timeline



- Less user space context switches
- Better HW operation pipelining
- Allow specialized HW to negotiated even lower latency transfer methods

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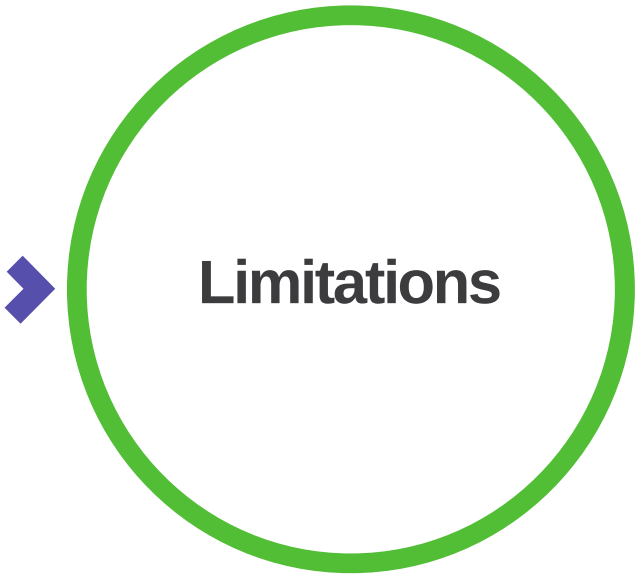
What are the limitations ?



- Real HW timestamp might not be available, making this difficult to use for a capture device
- Design to do work as fast as possibly, which does not fit very well with audio/video synchronization case

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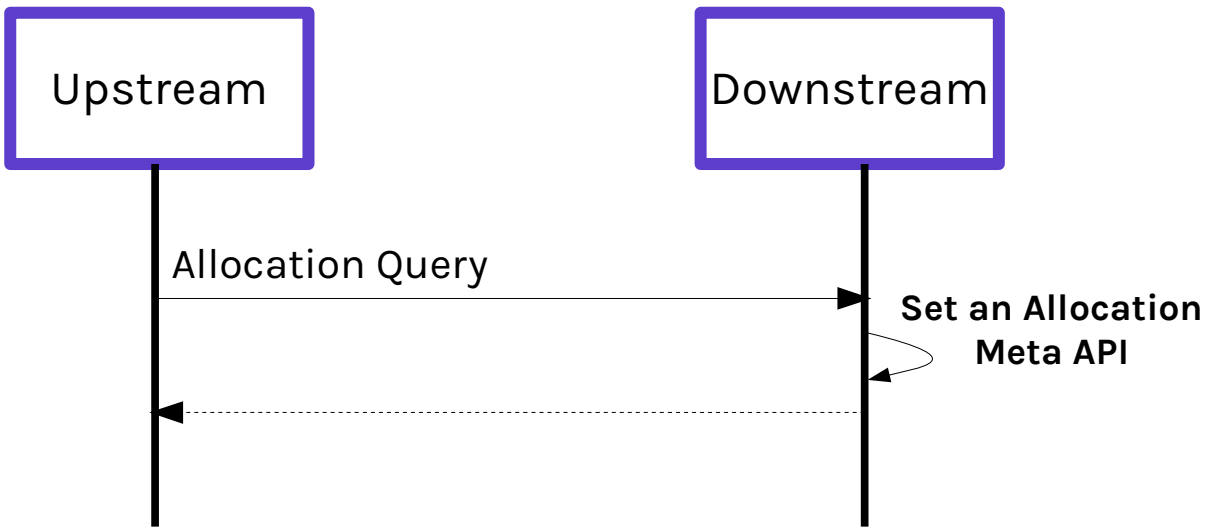
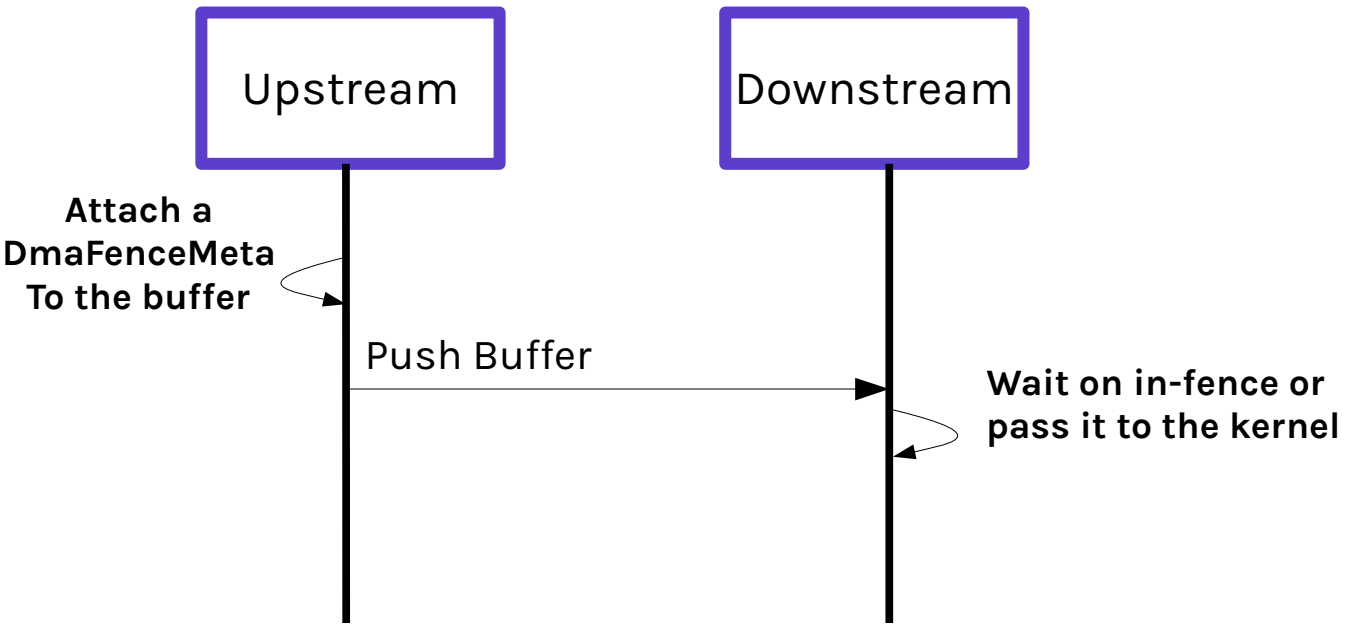
How could we implemented this ?


Negotiation


Upstream
Downstream
Allocation Query
Set an Allocation
Meta API

Pushing Buffers



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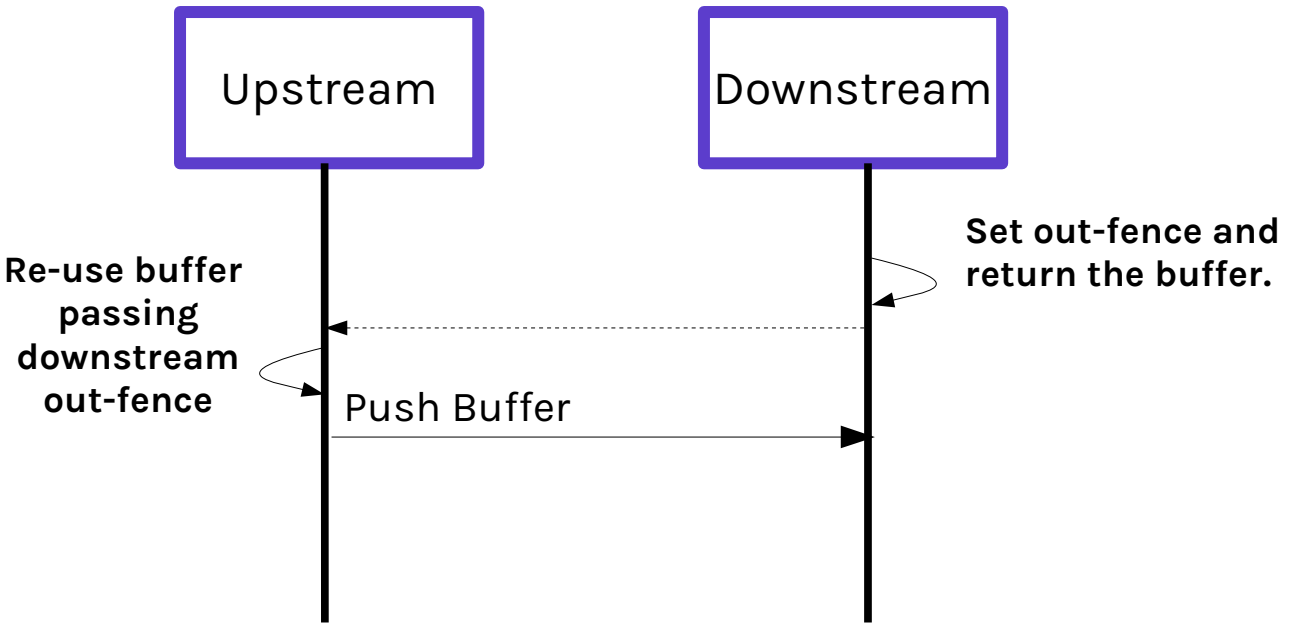
Returning Buffers

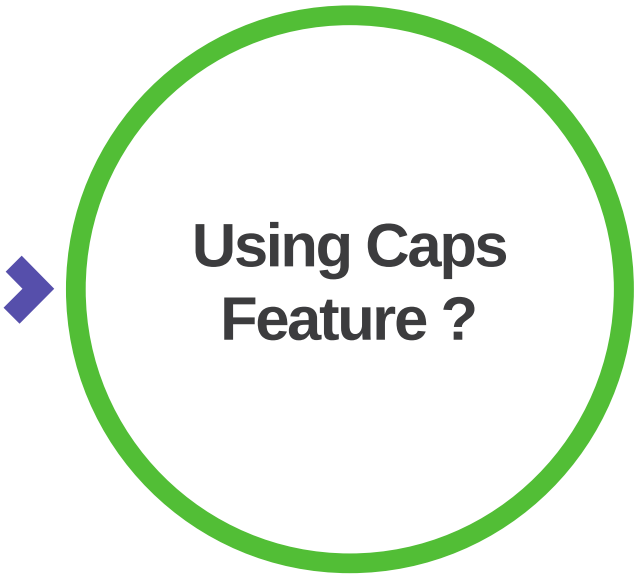


Is that right ?

But this is for DMABuf, which are GstMemory ?

GstGL is doing that and it was notice it fails with tee

How do we make sure in-place filters will work



“We are defining a completely new way of accessing the data”

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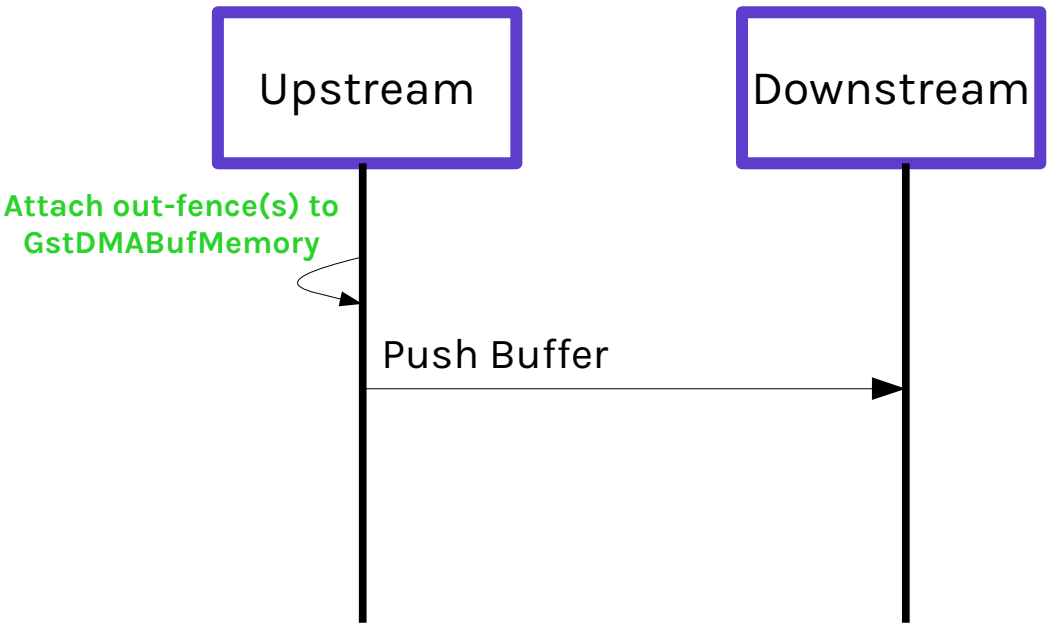
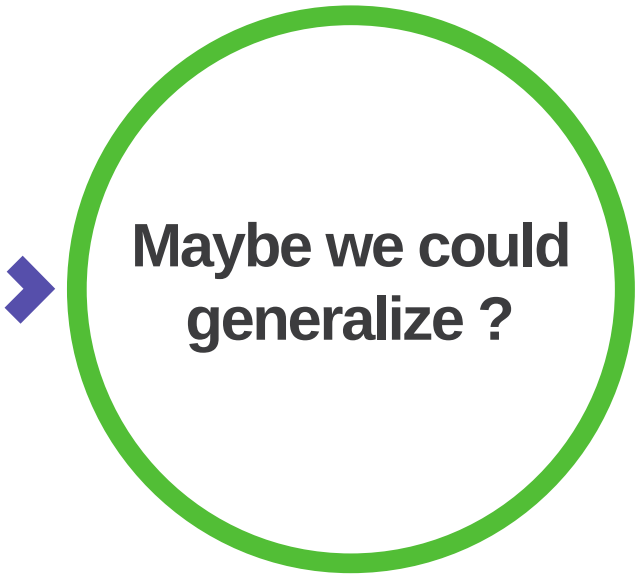
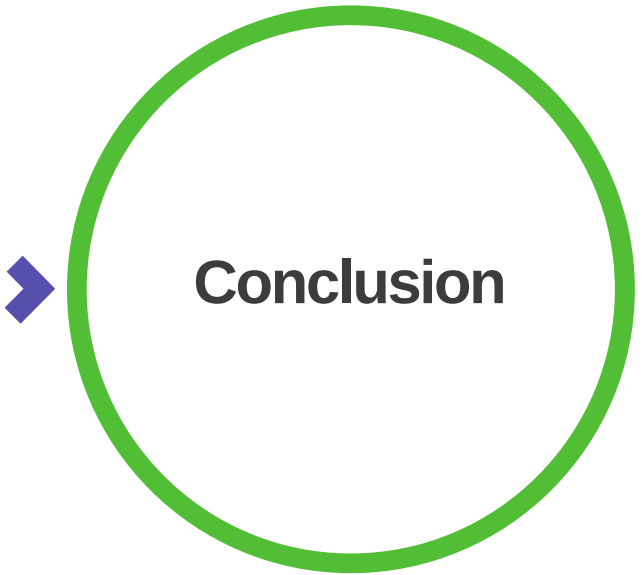
Special API of the DMABuf Allocator





- Integrate Fence API directly into GstMemory
- Also support software fences, special operating modes (notifying per lines, tiles, etc.)
- And then DMA Fences and GL Fences becomes just a sub-type.



- DMA Fence are currently specialized for GPU Operation
- They don’t allow driver to software optimization by delivering parcels
- They are not supported by the Network Drivers
- They can greatly improve efficiency for purely hardware pipelines
- The notion of fence could be generalized in GStreamer to improve our efficiency when dealing with high bit-rate streams.

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Questions

Thank you!