Virtio-Loopback GPU discussion

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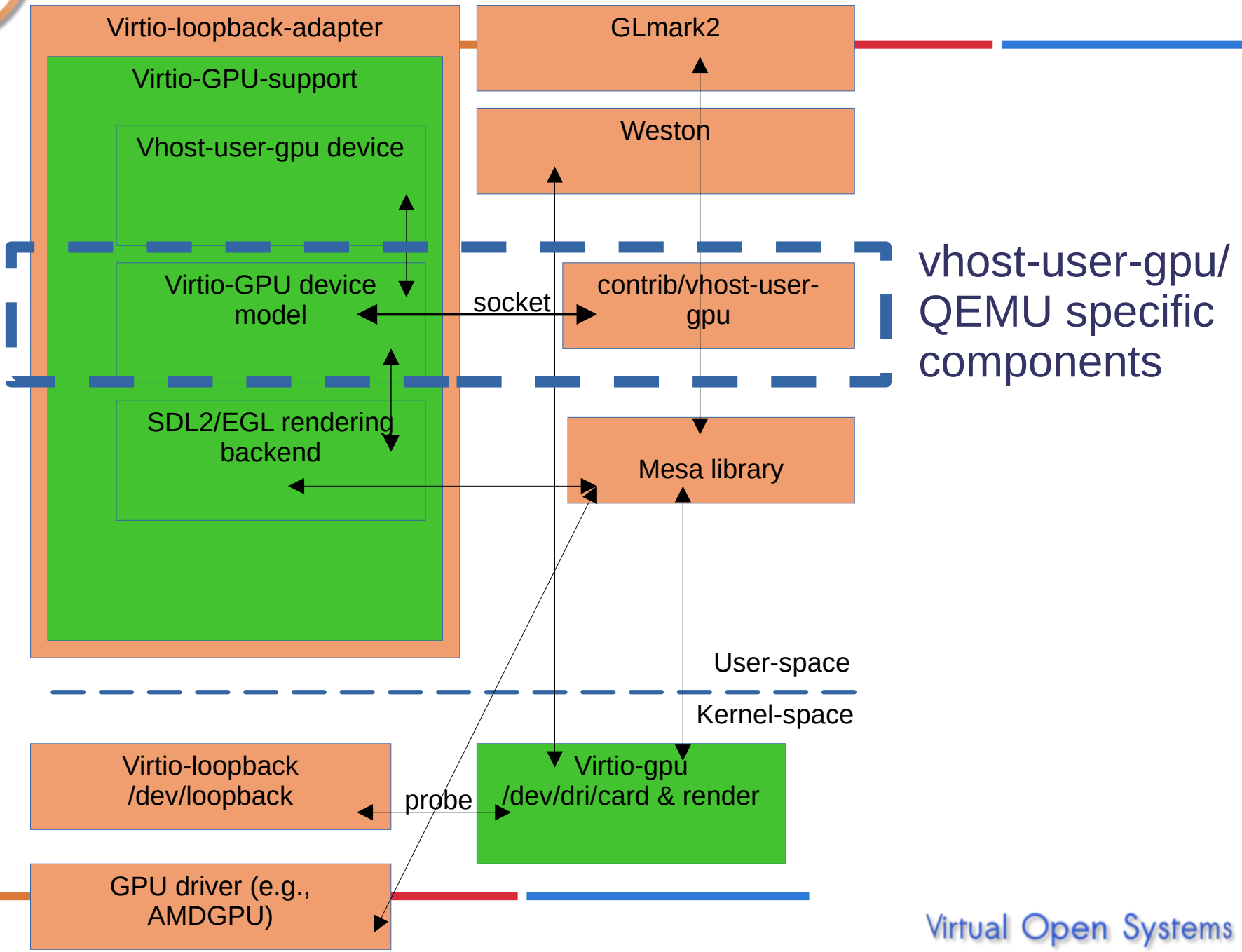
virtio-loopback & gpu

As for GPU several versions of the devices are available

- GPU
  - vhost-user-gpu
    - C implementation, well tested and broadly used
  - Virtio-gpu-rutabaga (Rust), cross-platform abstraction for GPU and display virtualization
    - Based on the VIRTIO_GPU_CONTEXT_INIT function in the kernel, simplifies user space
    - maturing rapidly

Vhost-user-gpu picture



vhost-user-gpu description

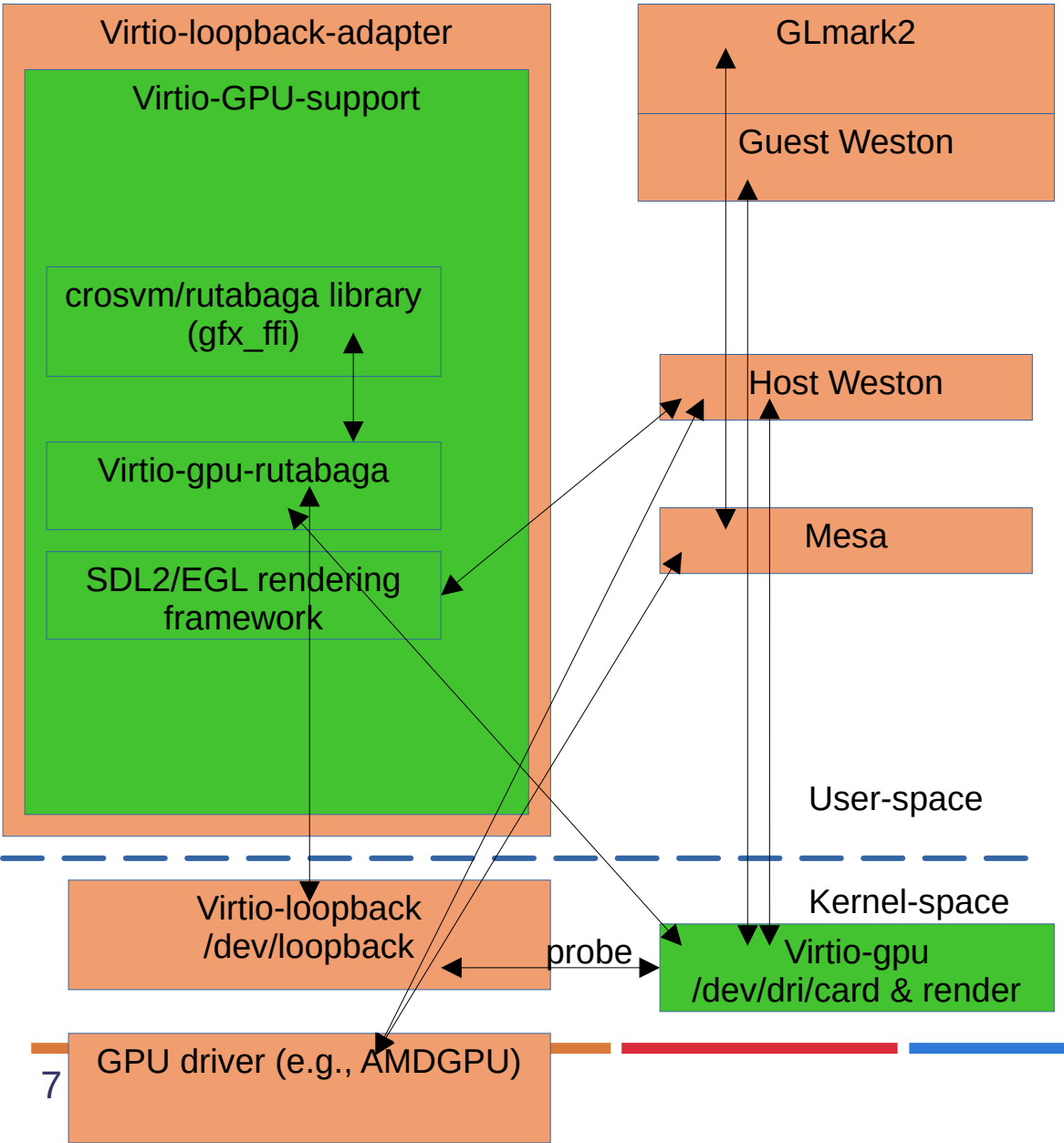
- Vhost-user-gpu requires an external application (QEMU:`contrib/vhost-user-gpu`) to serve the composition requests
- It uses vhost-user-gpu, an custom extension of vhost-user protocol, to communicate between the vhost-user-gpu and QEMU
  - It encapsulates requests from allocating memory for graphic-related objects and the emulation of a 'hardware vsync'/frame update.

vhost-user-gpu status

- vhost-user-gpu and virtio-gpu device models development/porting from QEMU to the adapter
  - vhost-user-gpu protocol interactions took place, without the ability to have normalized and contiguous rendered frames
  - Vhost-user-gpu protocol issues – composition side – redraw and allocation of buffers don’t work
- Rendering infrastructure to instantiate and render frames of the virtio-gpu device via the SDL library
  - The SDL foundations were ported from QEMU, and tested with frames stored on the filesystem (not virtio-gpu realtime).
  - To be used in the non sommellier use case of rutabaga
- Under further examination

Virtio-gpu-rutabaga - QEMU-like deployment

‘QEMU’ use-case (two compositors)



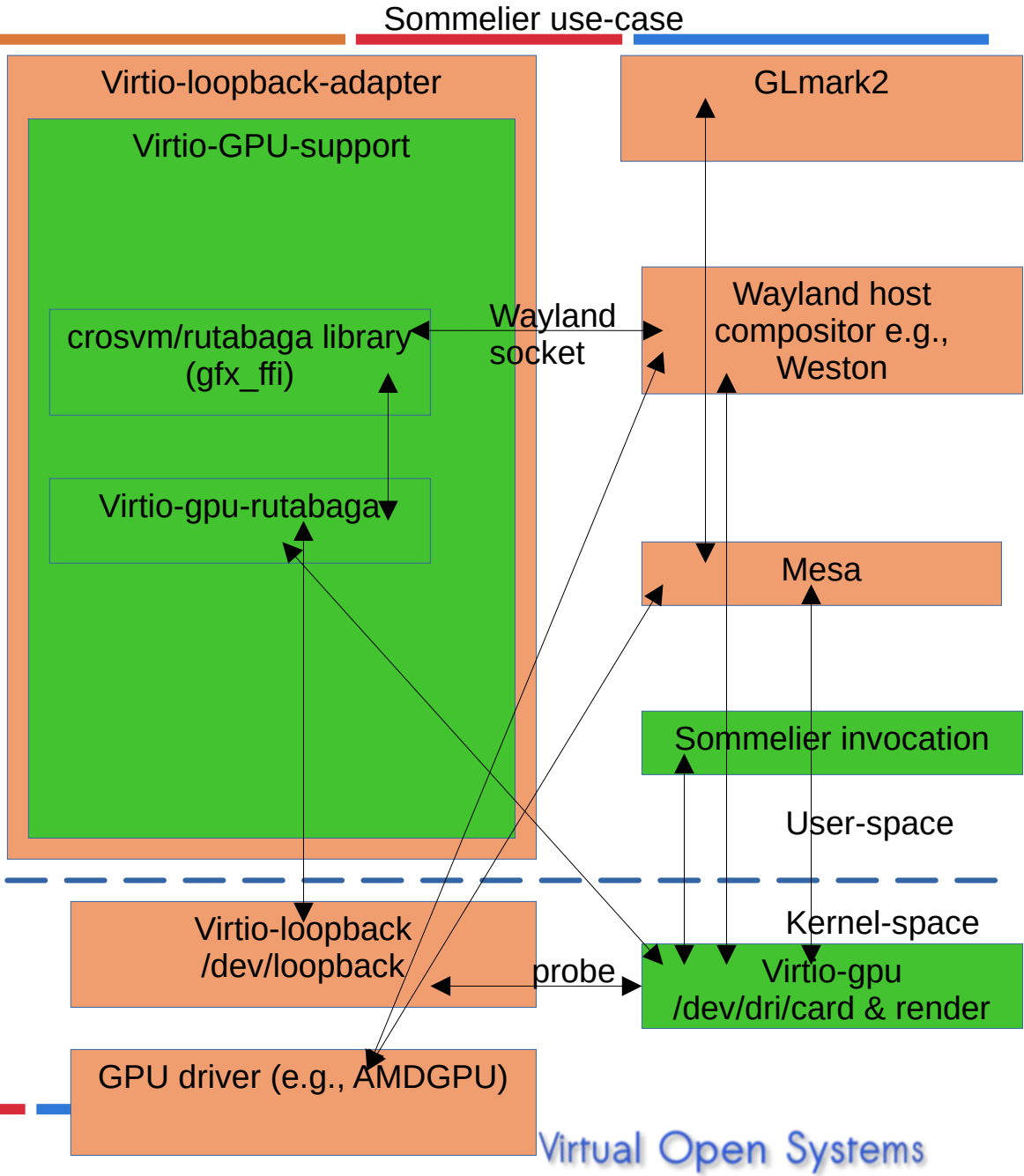
Rutabaga supports two use cases:

- **QEMU-like**: Instance a new compositor
  - Same as vhost-user-gpu – i.e., guest runs compositor
  - A new compositor is run to support the virtio-gpu application
- Sommelier: Use the compositor of the host

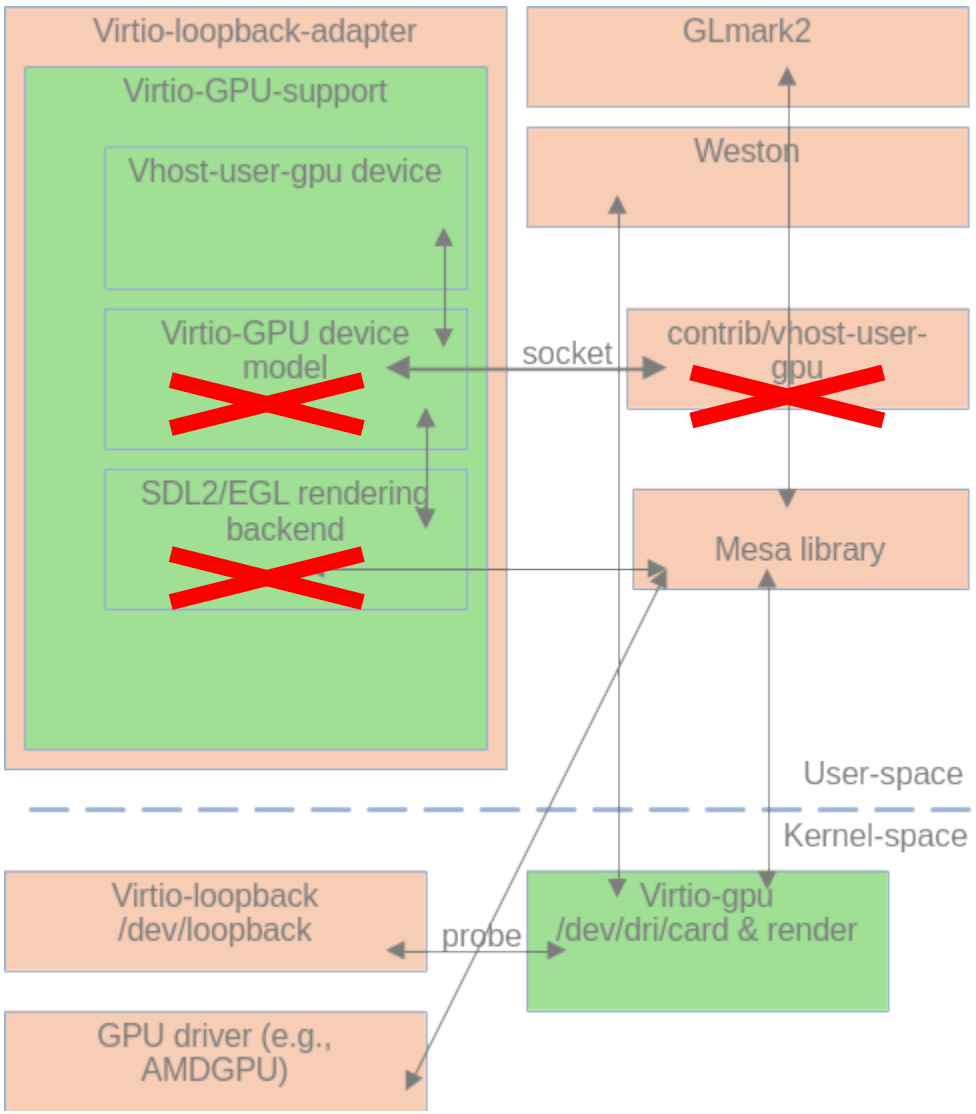
Virtio-gpu-rutabaga - sommelier deployment

Rutabaga supports two use cases:

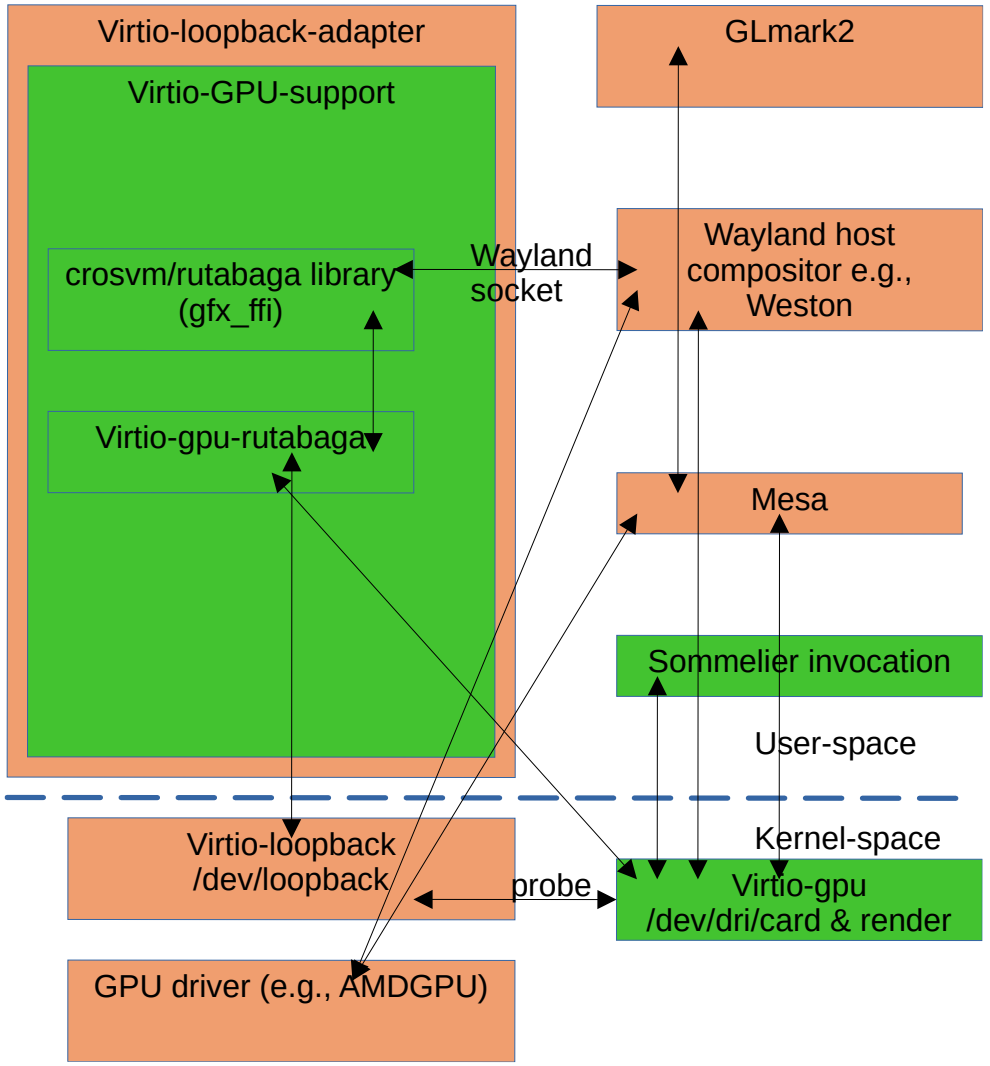
- QEMU-like: Instance a new compositor
  - Same as vhost-user-gpu
  - A new compositor is run to support the virtio-gpu application
- **Sommelier**
  - Use the same compositor of the host (efficiency)



Pictures comparison



Sommelier use-case



Virtio-gpu-rutabaga

- Rutabaga (rust) is part of crosvm, sommelier (C++) is part of chromium os
- Can use system resources more efficiently, because we are not obliged to run additional weston compositors
- In the sommelier deployment, applications are launched by the use of the launcher application `sommelier`
  - Sommelier is a wayland compositor that performs rendering operations
- Simplify the architecture removing vhost-user-gpu protocol and vhost-user-gpu
  - Better maintenance
  - Easier porting
- No need to modify existing virtio-gpu applications, the same used with vhost-user-gpu can be executed – in any deployment type

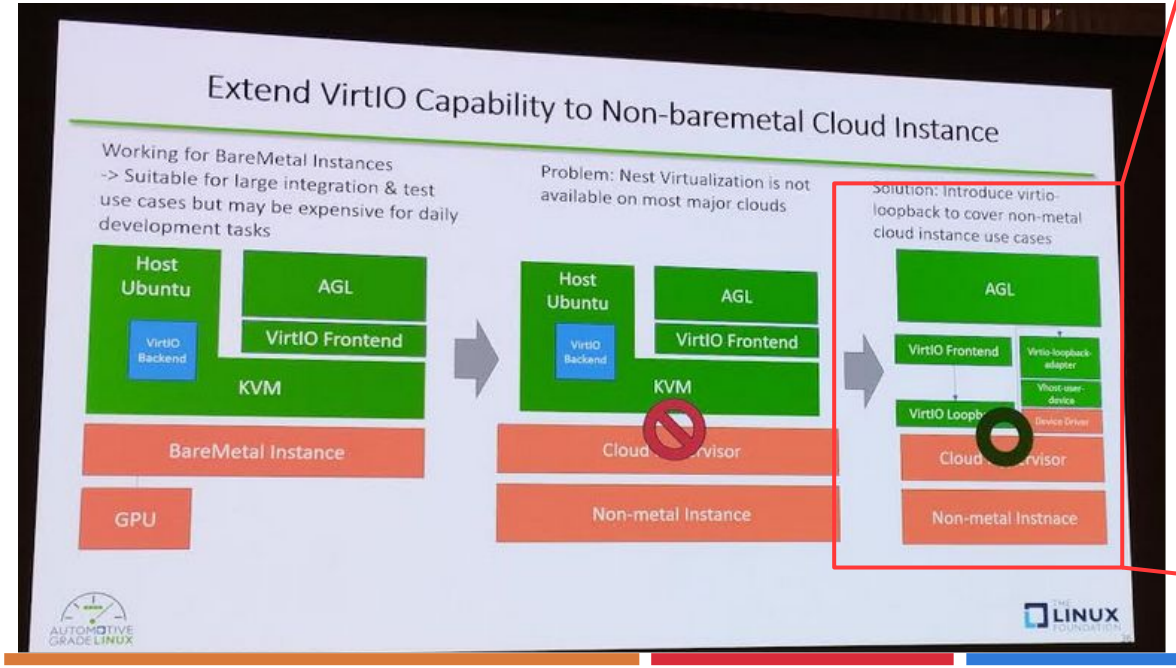
Virtio-gpu-rutabaga status

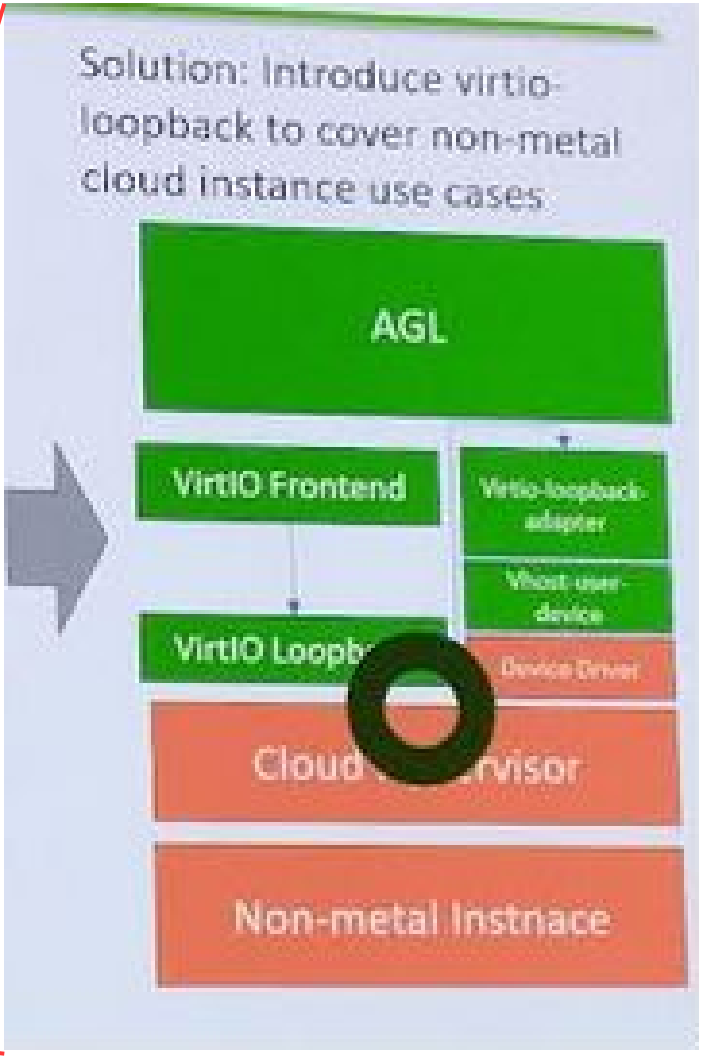
- All the software components have been ported or implemented
- Both use cases will be eventually supported, starting from the sommelier one
- At the moment we are verifying that all the connected parts have been wired correctly.
- Functional tests and benchmarks will follow

Use case discussion

Use case with

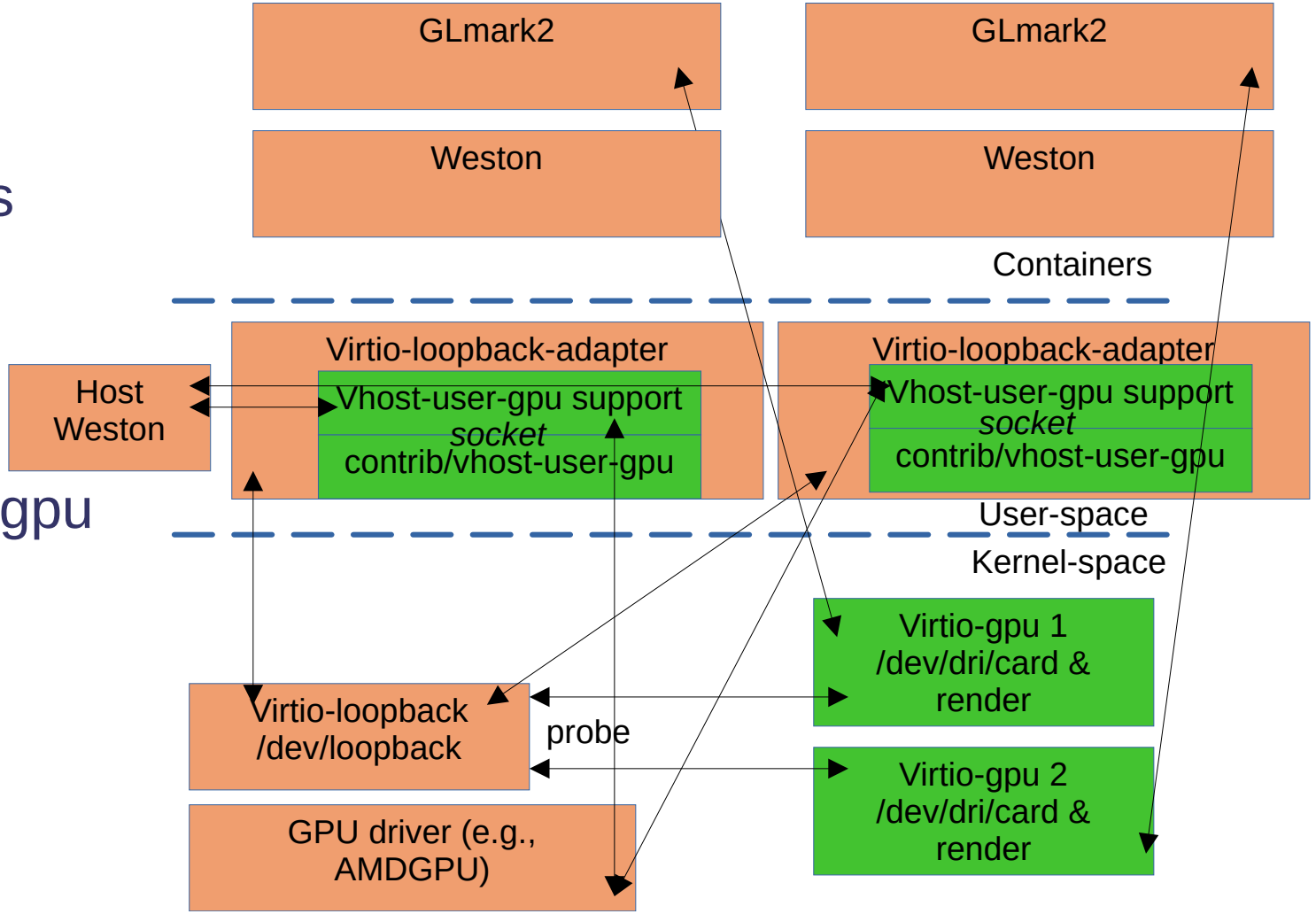
- Two applications (or containers) want to use virtio-GPU
- The system is using virtio-loopback



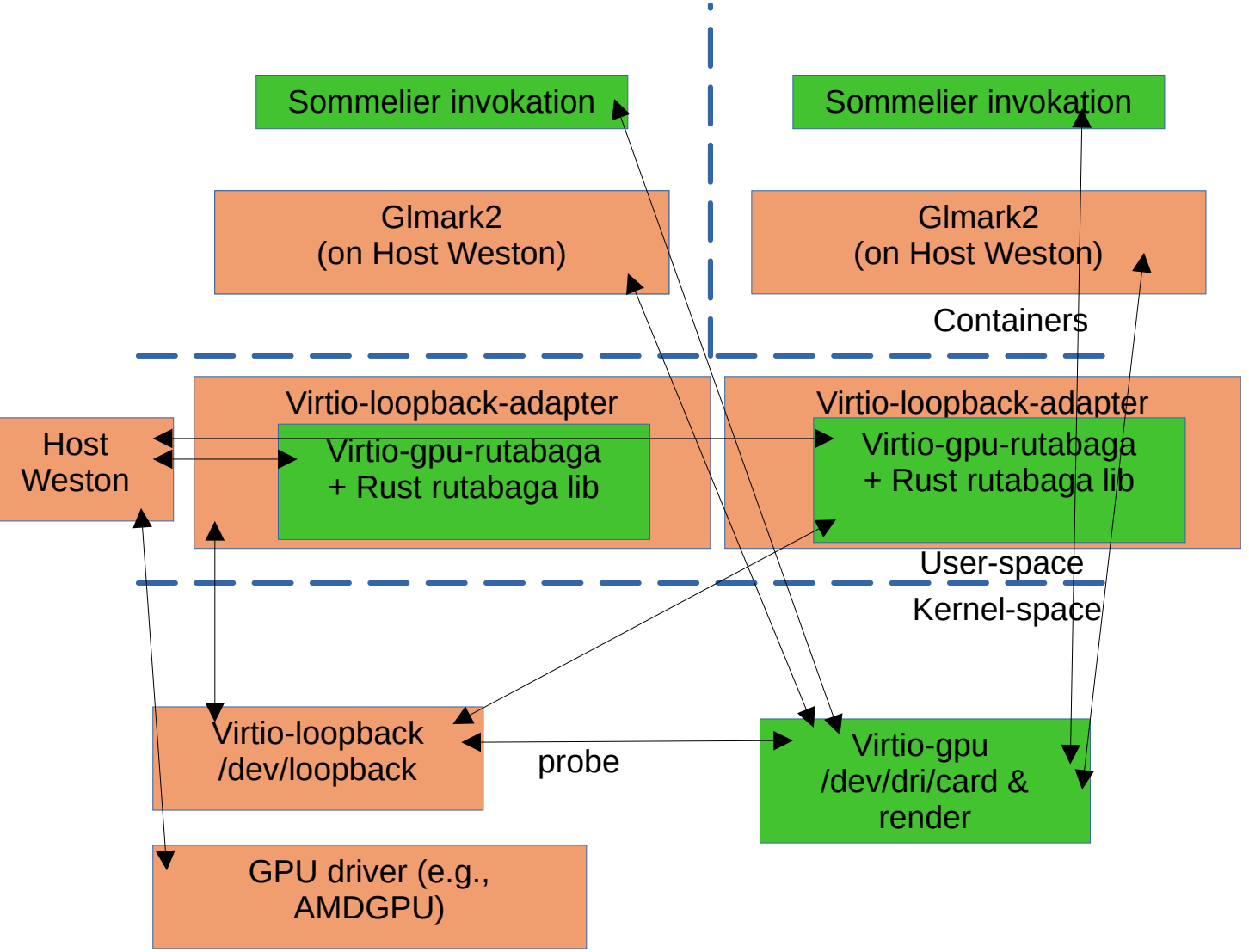


Use case discussion - vhost-user-gpu

- Two applications
- 2+ weston compositors
- Two virtio-gpu
- Two vhost-user-gpu



Use case discussion - rutabaga



- Two applications
- ~~Two~~ one weston compositor~~s~~
- ~~Two~~ One virtio-gpu
- ~~Two vhost-user-gpu~~

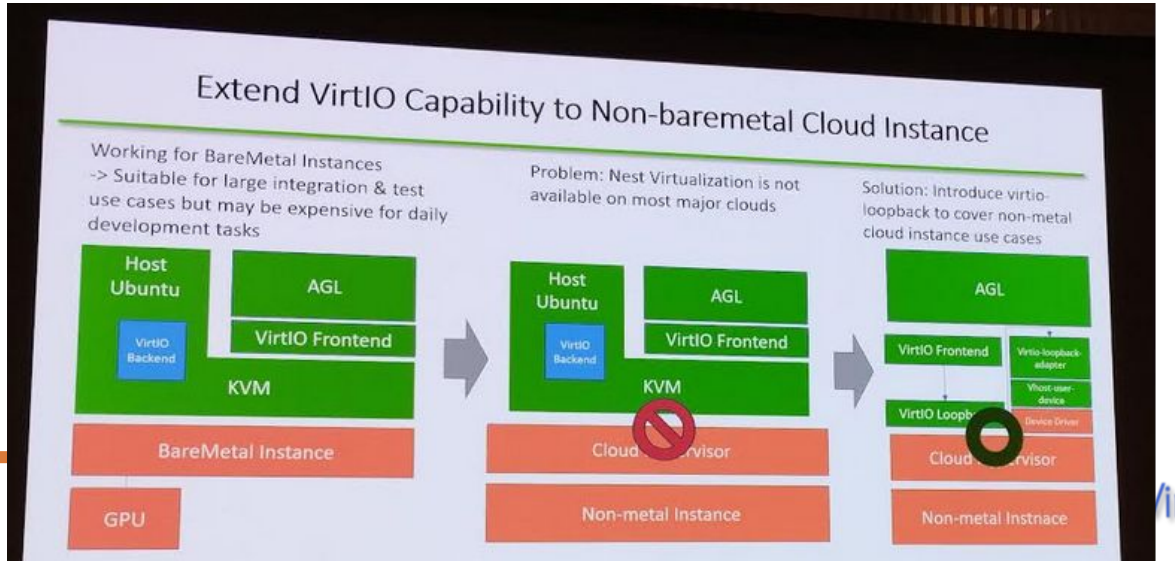
Use case-based comparison

- Vhost-user-gpu
  - At least two weston instances (one for the host, one for the application that you want to render)

- Rutabaga
  - Efficient use of weston instances (lightweight compositor integrated in sommelier)
  - Supports both QEMU-like and sommelier use case
  - No need to modify existing applications
  - Less components, easier to maintain

Conclusions

- vhost-user-gpu works very well in use cases where a full system is virtualized (applications + weston, as in the first two use cases below)
- Rutabaga gives in addition the possibility to share a single (host) weston instance
  - This solution leads to a simpler and more efficient solution, with no compromises at functional level



Proposed next steps

- Get a first rutabaga demo
  - Some test will be done on the virtio-loopback side to see if the rendering node is behaving as expected (simple DRM tests)
  - The sommelier use case will be tested first as it involves less moving parts

Questions

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