Advanced Driver Information Technology

Waltham transmitter upstream

From AGL to Wayland community

Agenda

- **Motivation**
- **Requirements**
- **Current solutions**
  - Remoting plugin
  - Waltham
- **Ideas**
- **Discussion points**

Motivation

Future cockpit system

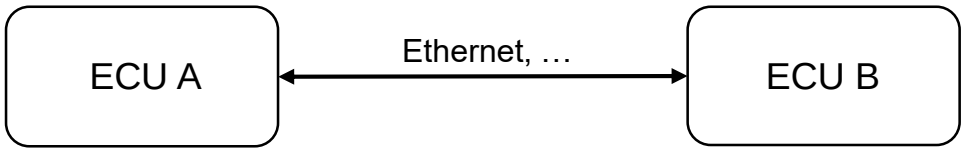
- Multiple displays
- Different hardware, different companies
- Seamless integration of content
- Content not fixed to one display

Advanced Driver
Information Technology

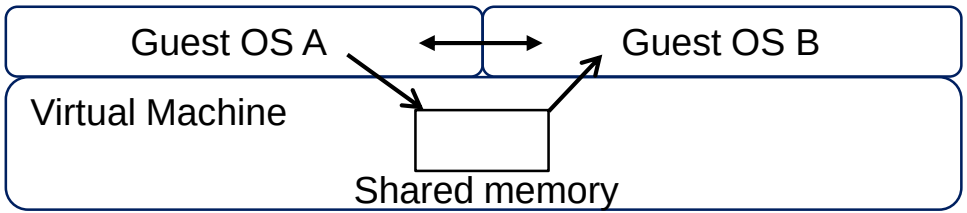
Motivation

Realization method of sharing

- **Sharing between multi ECUs**
  - Data are shared over network



- **Sharing between guest OSs on virtualization environment**
  - Data are shared on shared memory or over virtual network



Both graphic sharing mechanism and protocol are needed for sharing

High level Requirements

- A buffer shall be shared per application surface.
  (per display is not flexible enough.)
- A buffer shall be shared between multi ECUs.
- A buffer shall be shared between multi OSs on hypervisor.
- A buffer shall be shared for multiple receivers.
- Input events shall be handled at the same time of buffer sharing.
- Connection recovering mechanism shall be enabled.
- It shall be 60 fps.
- It shall work on OS other than Linux. (e.g. Android)

Current solutions

- **Virtual display sharing**
  - Remoting plugin
- **Surface sharing**
  - Waltham
- **For hypervisor**
  - GPU sharing, Display sharing
    - SoC Specific

Current solutions

Remoting plugin

- **The remoting plugin can only send per virtual display. It cannot send per surface.**
- **The remoting plugin just send virtual output and don't handle input.**

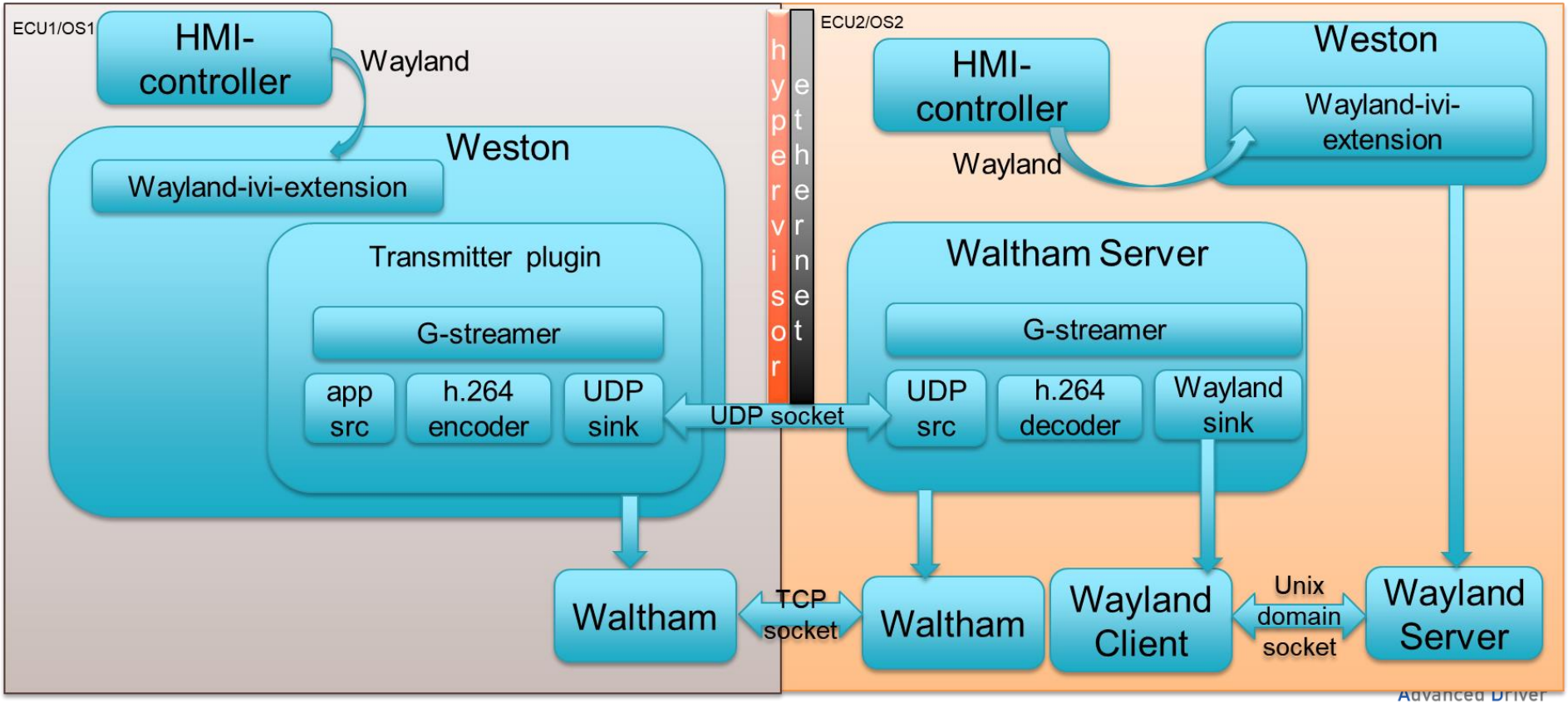
Current solutions

Waltham

- **ADIT has two implementations**
  - For AGL
    - Waltham is just used for starting gst streaming.
    - A buffer is shared on RTP.
    - Only touch event is tested. (keyboard and pointer events are not tested.)
    - Weston v2.0 based.
  - For customer project
    - Waltham is just used for touch forwarding on hypervisor.
    - A buffer is NOT shared. Gst streaming is also NOT used.
    - Buffers from both OSs are scanned out by drm directly.
      (GPU sharing and Display sharing are used.)
    - Weston v2.0 based.

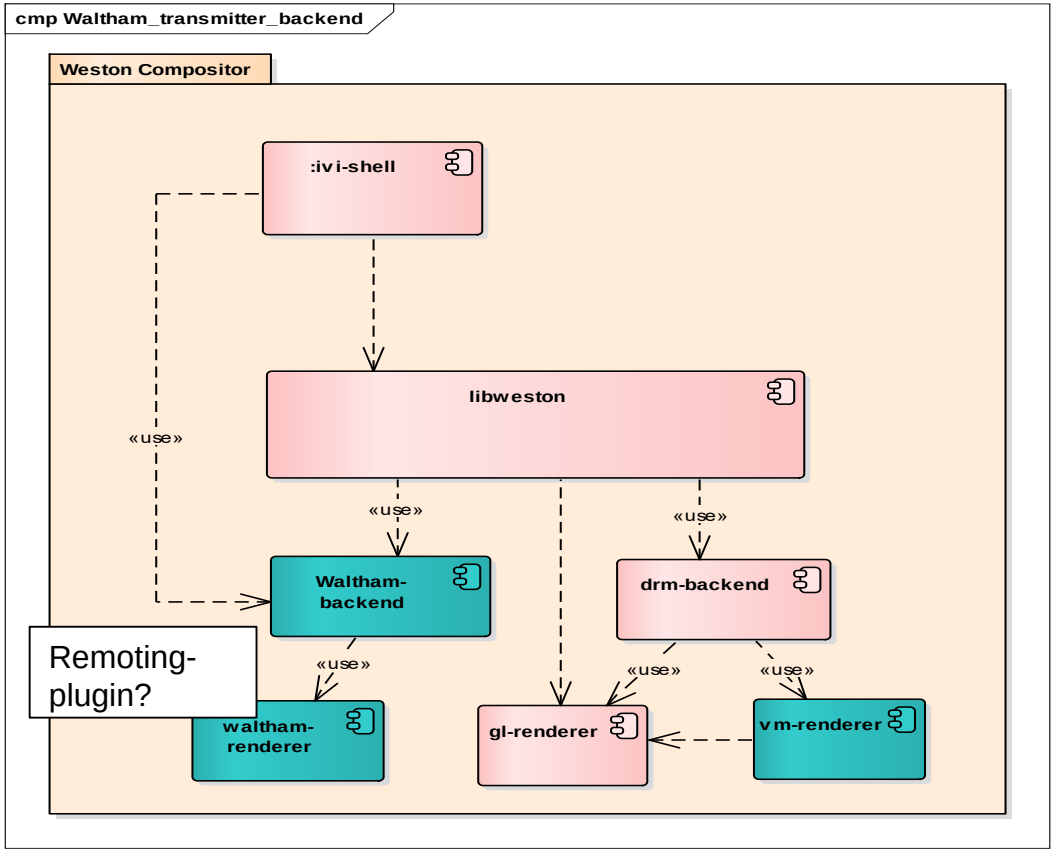
Current solutions

Waltham in practice at ADIT



Ideas

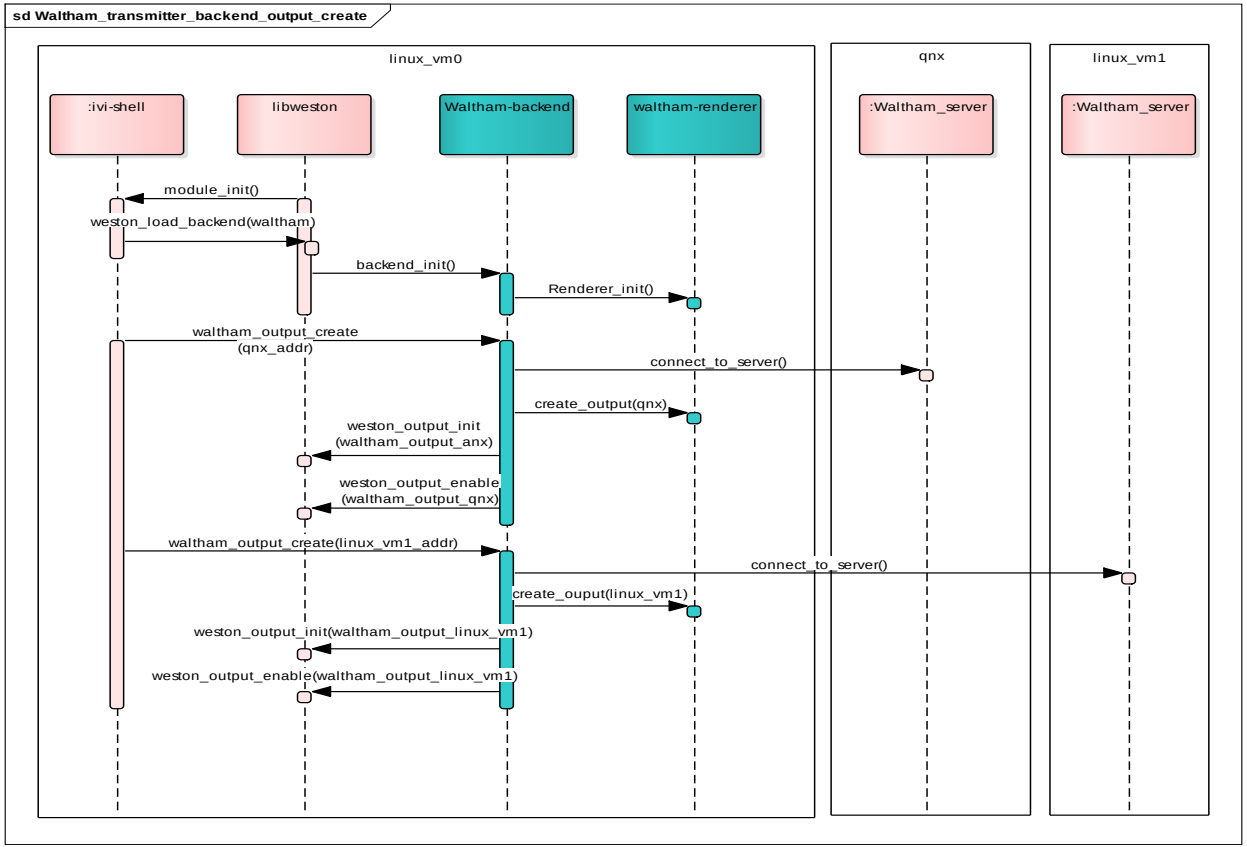
Waltham transmitter as Weston backend



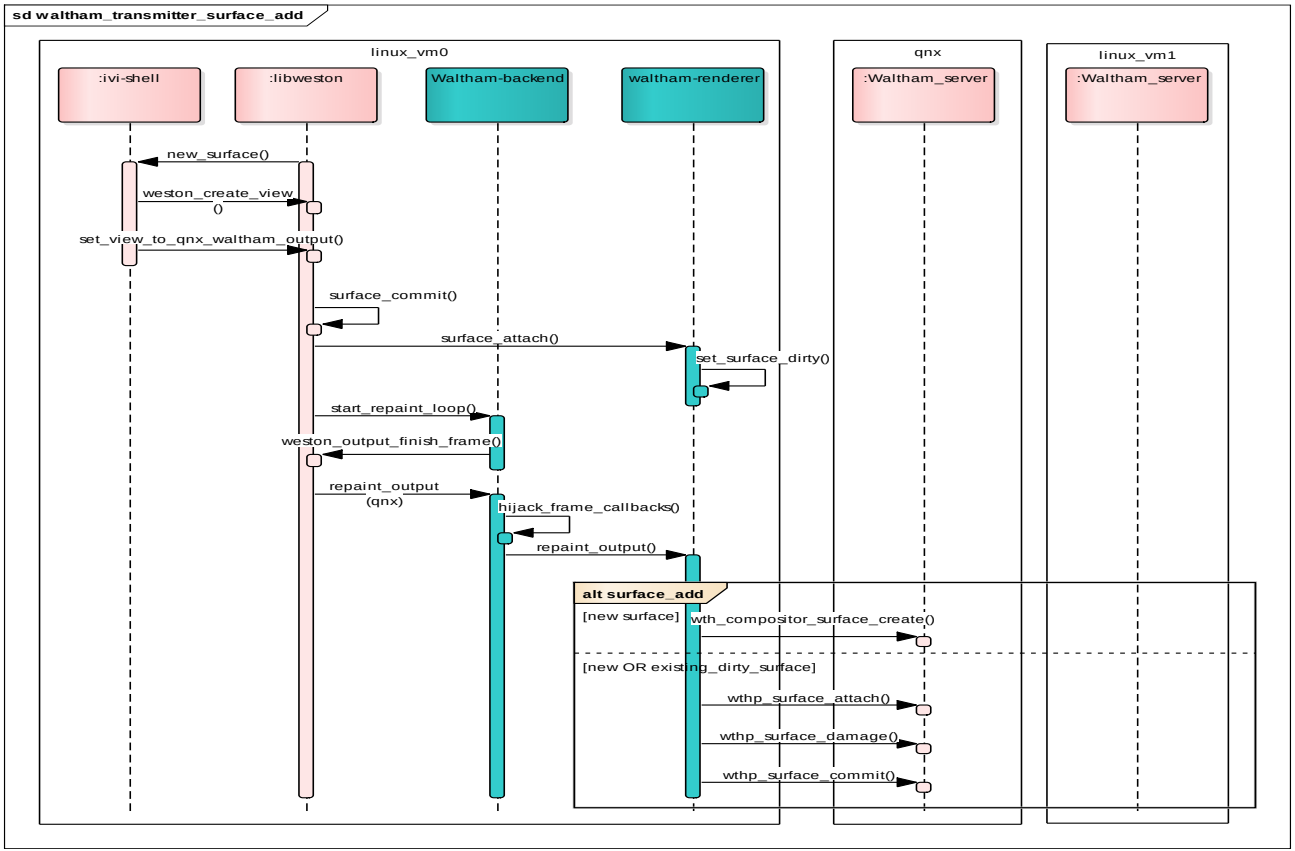
Ideas
Waltham transmitter as Weston backend

- Libweston should implement support for multiple backends and multiple renderers
- A Waltham backend similar to Weston backend can be implemented. Differences lie in terms of handling frame callback and creation of multiple connections.
- Waltham backend should implement input handling. It is also the right place to handle input as per Weston architecture.
- Waltham renderer implements the rendering part. There is not rendering as such but it takes care of sending buffers to Waltham server.
- Multiple server connections can be realized by creating multiple outputs in Waltham backend.
- Surfaces can be associated to outputs by means of ilm_screenSetRenderOrder interface.

Ideas
Waltham transmitter as Weston backend



Ideas
Waltham transmitter as Weston backend



Ideas
Waltham transmitter as Weston backend - Pros

- **Provides provision for input handling as per Weston architecture.**
- **Waltham output is treated as any other output. This means there are no additional changes in ivi-shell apart from creation of Waltham output.**

Ideas
Waltham transmitter as Weston backend - Cons

- **Requires changes to core Weston (libweston) to handle multiple backends and multiple renderers.**
- **Libweston obtains properties of a surface(width, height, buffer) from renderer. So libweston is coupled to use a single renderer. Present solution requires a change to take “surface properties” part out of renderer. This means changes and tests to multiple renderers and backends are needed. This could be quite too much.**

Discussion points

- **What is AGL's strategy?**
  - Use Weston for the future as well? Or create own compositor?
  - Does Waltham still fit to the strategy?
- **How to harmonize with remoting plugin?**
- **How to abstract buffer sharing technologies?**
  - Gstreamer
  - Raw buffer sharing via Waltham
  - SoC specific technology like Hyper DMA-BUF
  - …

References from ADIT

- **AGL**
  - All Member Meeting Winter 2017
    - https://wiki.automotivelinux.org/eg-ui-graphics
      - 20170209_ui_and_graphics_eg_waltham.pdf
  - All Member Meeting Europe 2017
    - https://sched.co/C9rQ
- **Genivi**
  - GENIVI Technical Summit
    - https://at.projects.genivi.org/wiki/display/WIK4/GENIVI+Technical+Summit+Session+Content+2018
      - ADIT/Bosch Implementing Waltham in practice
      - Waltham in Practice - working session (Harsha Manjula Mallikarjun)
  - GENIVI 18th All Member Meeting
    - https://at.projects.genivi.org/wiki/display/WIK4/18th+GENIVI+AMM+Presentations
      - Domain Interaction - Wayland-IVI-extension / Waltham Usage in Shared Graphics Environment

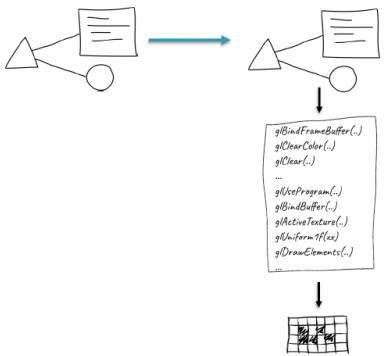
Appendix

Current solutions

API remoting: RAMSES

- https://at.projects.genivi.org/wiki/display/DIRO/RAMSES

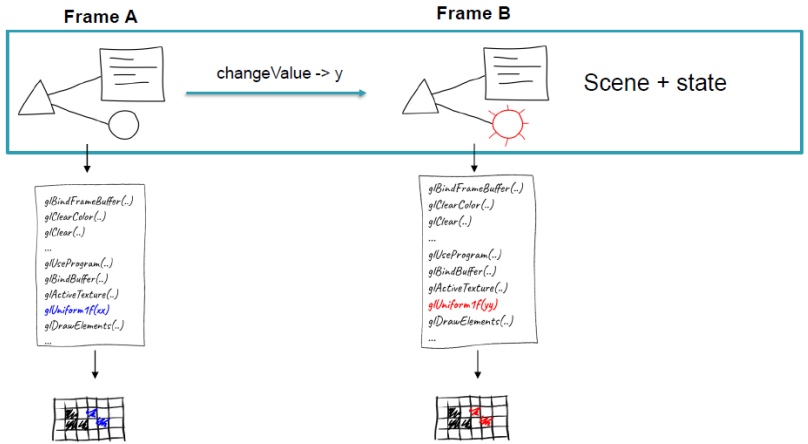
Solution ideas:
4. Scene-based distribution



- ✚ Low network bandwidth needed especially after initial transfer
- ✚ No compression artifacts
- ✚ Easier scaling to higher resolutions
- ✚ No GPU needed on sending side
- ✚ Graphical interaction possible between scenes from different ECUs
- ➖ Application has to provide content with special API

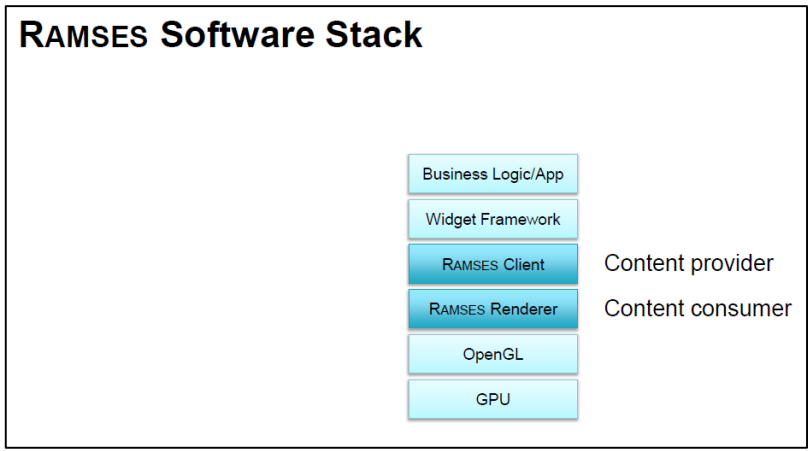
GENIVI®

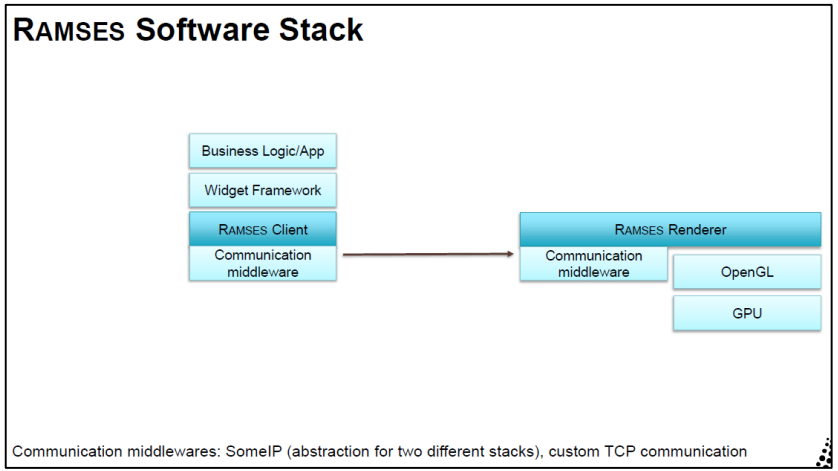
Update of frames: Scene-based distribution



Current solutions

API remoting: RAMSES





- **RAMSES repuires quite big modifications in the exsisting components.**
- **RAMSES became OSS but it is not general as of now.**