



Introduction of UnifiedHMI

Panasonic Automotive Systems Co., Ltd.

UnifiedHMI Technology

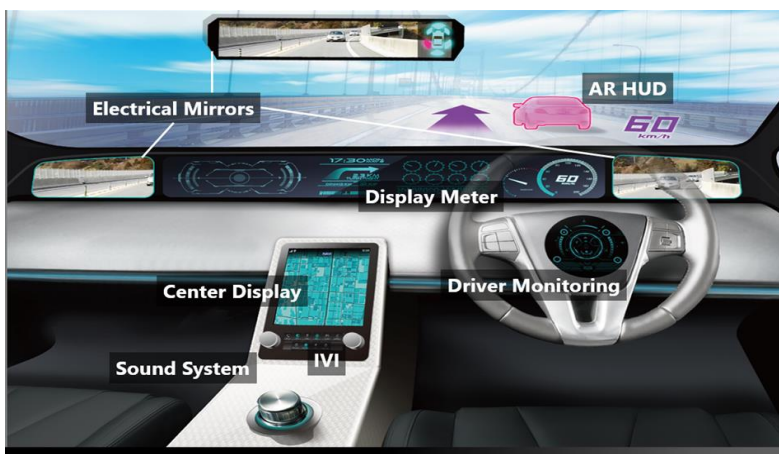
Enabling Innovations for Integrated Cockpit UX by “Display Virtualization Technology”

- **Remote VirtIO GPU (RVGPU)**

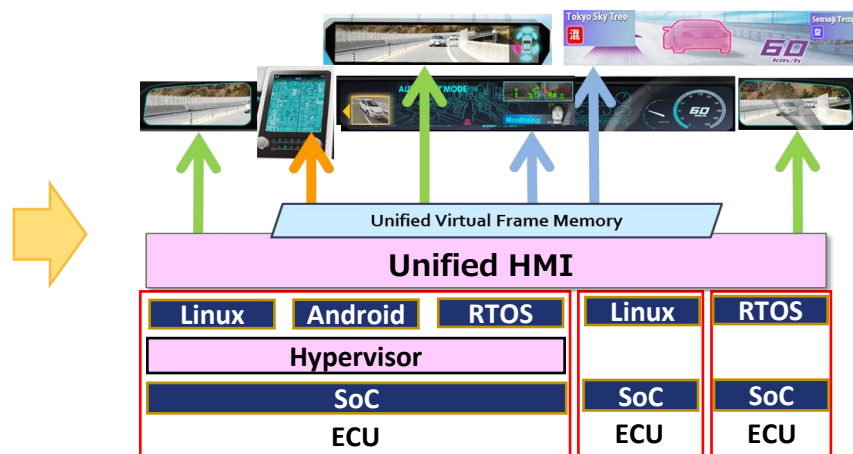
A display virtualization technology which extends VirtIO GPU to provide a client-server based remote rendering engine.

- **Distributed Display Framework**

A high-level framework, including a distributed window manager and related utilities, to provide an integrated layout control of multiple displays by using RVGPU.



Multiple displays on integrated cockpit system



Integrated control of multiple displays on distributed SoC system

Values provided by Unified HMI

- **Flexible and Optimized Application Displaying across Multiple Displays**

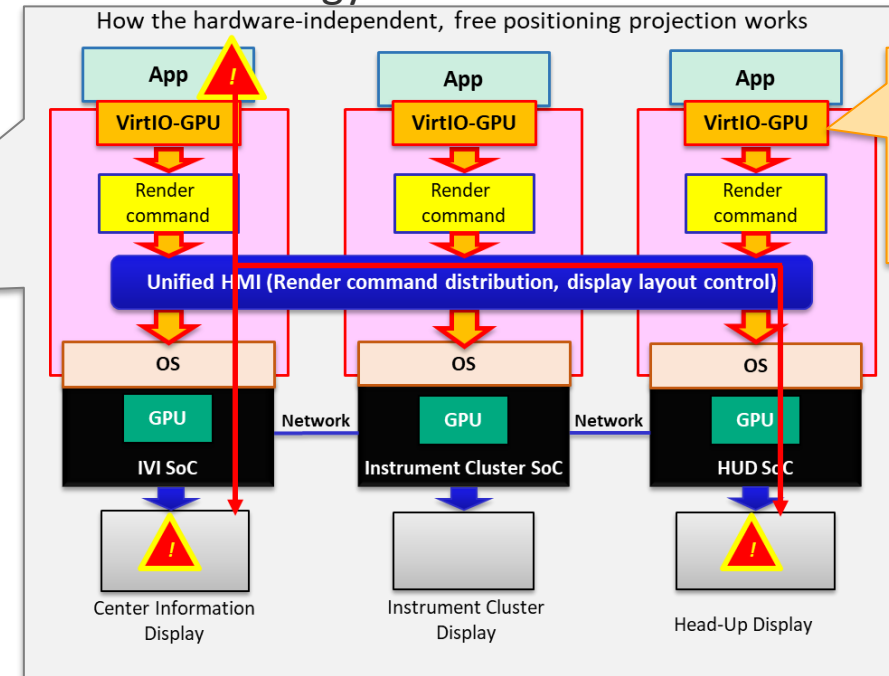
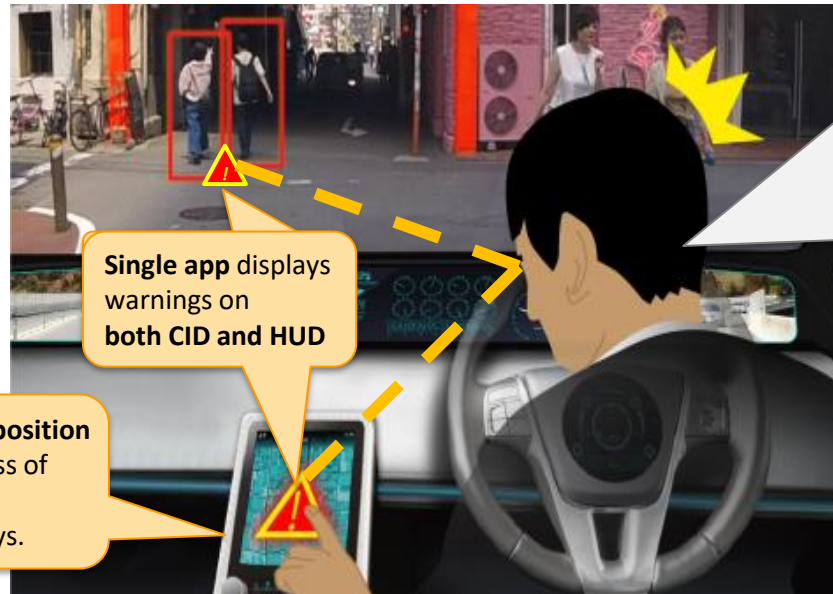
Applications are able to be displayed in an optimal location at optimal timing with optimal contents (e.g. warning information displays based on eye-gaze detection).

- **Scalable Deployment of Applications to various hardware**

Reduce application dependency on graphic hardware (including displays and GPU) to enable a scalable development & deployment of application to different vehicle variants or generations.

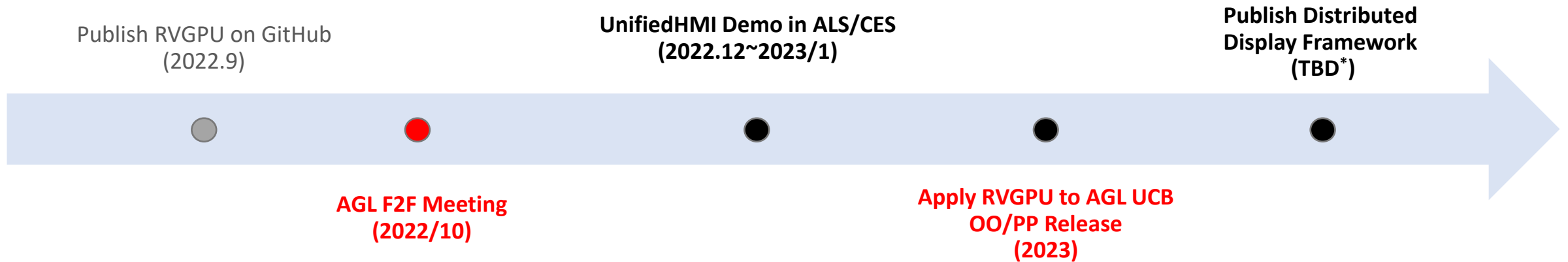
- **Interoperable Ecosystem Building**

Open source and compliant with the standard graphic virtualization technology VirtIO-GPU



GPU virtualization interface (VirtIO-GPU) enables **independence** from the rendering hardware

Roadmap of UnifiedHMI



*) We need time to improve the maturity of distributed display framework source code before publishing it.

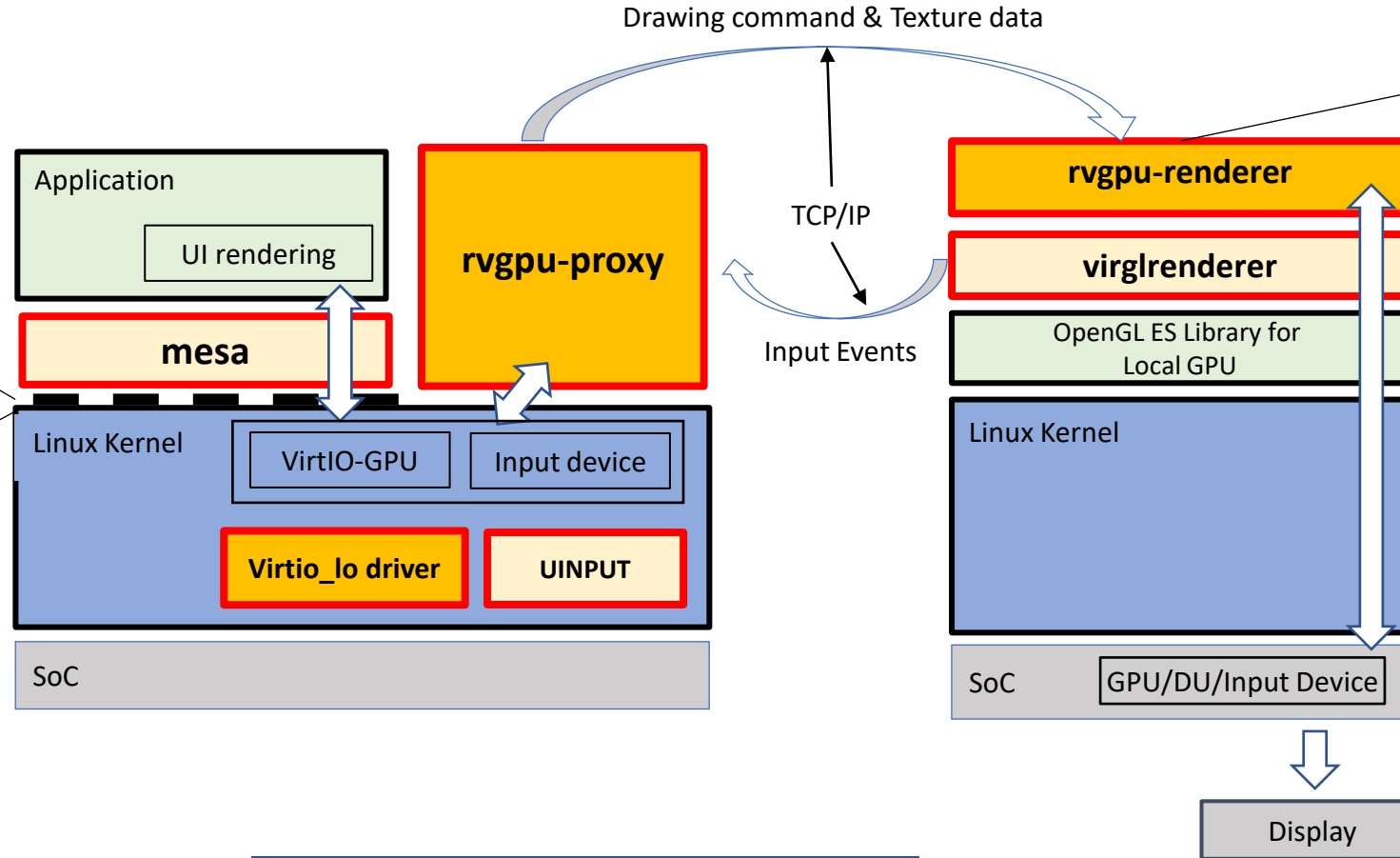
RVGPU Outline and Features

DRM/KMS Interface

A virtual DRM device (/dev/dri/cardX) related to VirtIO-GPU is created/removed at runtime.

User Input Interface

Virtual user Input devices (/dev/input/eventX) related to the virtual GPU like mouse, touch device and keyboard are created/removed at runtime.



Drawing Backend Support

- DRM/GBM
- Wayland desktop shell
- Wayland IVI extension
- AGL compositor (ongoing)

RVGPU Integration to AGL UCB (Proposal)

- **RVGPU Source Code**

- GitHub
<https://github.com/Panasonic-Automotive/remote-virtio-gpu>

- **AGL UCB Yocto Integration**

- *meta-rvgpu* layer
 - Recipes for RVGPU utilities.
 - Patches, configurations and packagegroups
- *agl-rvgpu* feature
 - Enable meta-rvgpu layer and related configurations
- Supported architecture
 - R-Car
 - StartKit H3/M3
 - Reference Hardware
 - X86 (Emulation)
 - Raspberry Pi 4
- Documentation
 - Procedures to use RVGPU utilities.

```
${AGL_TOP}-/  
    |- meta-agl  
        |-meta-agl-bsp  
        ...  
        |-templates  
            |-agl-all-features  
            ...  
            |-agl-rvgpu  
    |- meta-agl-devel  
        |-meta-agl-drm-lease  
        |-meta-eglvirt  
        ...  
        |-meta-rvgpu  
    |- external  
    ...
```

THANK YOU
