Remote Access and Output Sharing Between Multiple ECUs for Automotive

20/6/2018

Harunobu KUROKAWA

Open system development center ,
Automotive information solution business division
Renesas Electronics Corporation

BIG IDEAS
FOR EVERY SPACE

RENESAS

Today's Topics

1. Introduction
2. Multi display and Output sharing
   - Explain Current AGL demo system
3. Usage and customize
4. Current work/status and Future work
   - Update output sharing for next AGL
   - Upstreaming "weston remote access plugin" to community
5. Conclusion

1. Introduction

Who am I ?

Name : Harunobu Kurokawa

- Working in Renesas Electronics Corporation., for over 10 years.
  - ✓ 2007 – 2013 : Mobile platform software development and support.
  - ✓ 2014 – : Linux® for automotive, and AGL™(2016/Q4 ~).

Experience / Mission for AGL™ .

- ✓ Support Renesas BSP (2017~)
- ✓ AGL Demo integration set-up staff (2017~)
- ✓ Gatekeeper (2018 ~)

Renesas R-Car and Open Source Linux

- Renesas provide Yocto based BSP to customer and community

OEM/Tier1

Community

AUTOMOTIVE GRADE LINUX

GENIVI®

Business Partner

Renesas R-Car Consortium

Renesas R-Car and AGL

- Renesas R-Car series were selected as Referenced Board from 2015

2015

Agile Albacore

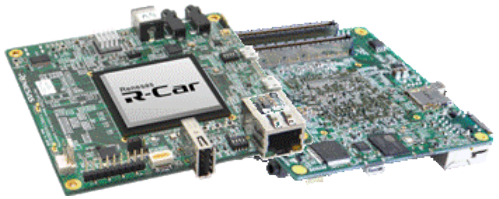
Brilliant Blowfish

2016

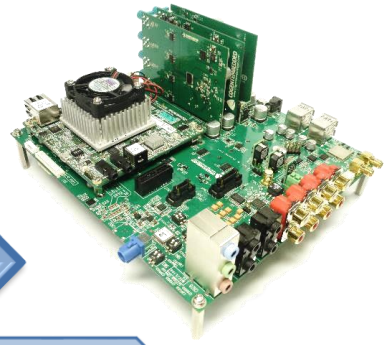
Charming Chinook

2017

Daring Dab:
R-Car Starter Kit debut



Electric Eel:
Starter Kit and Kingfisher



2018

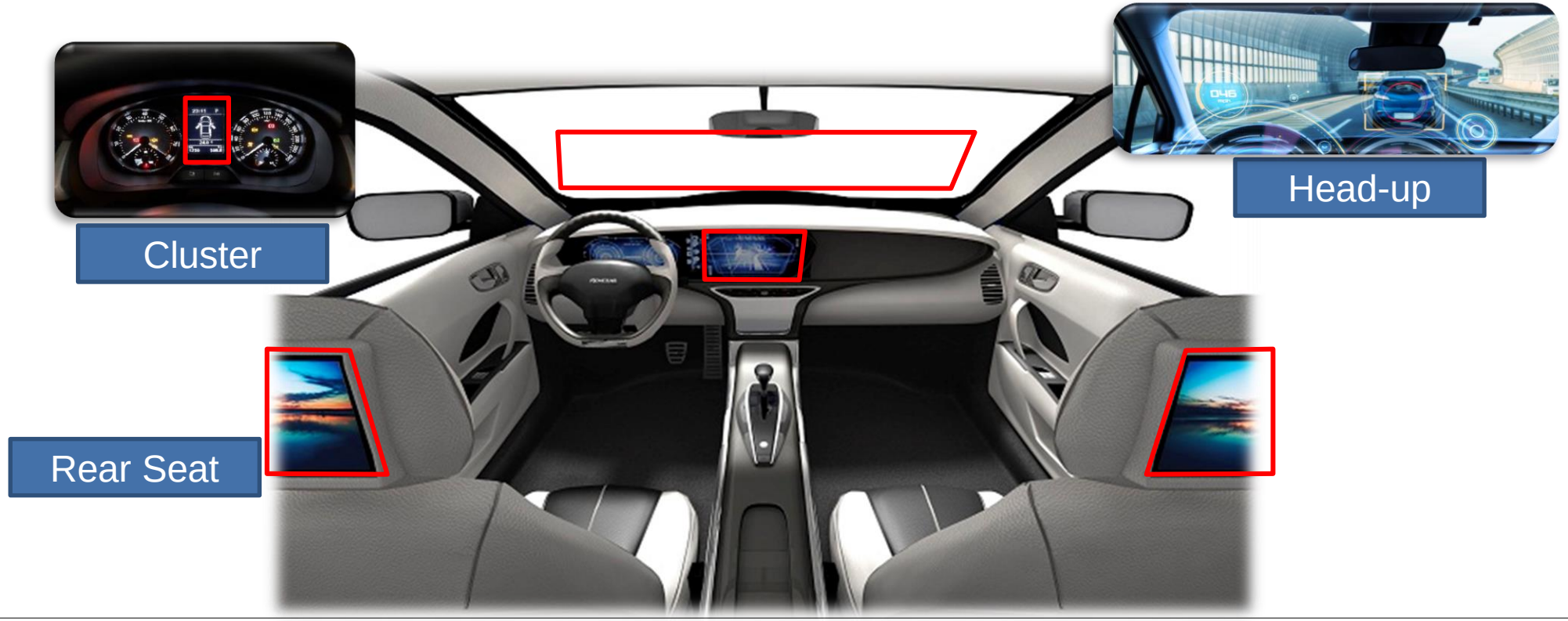
Funky Flounder

Grumpy Guppy

2. Multi Display and Output Sharing

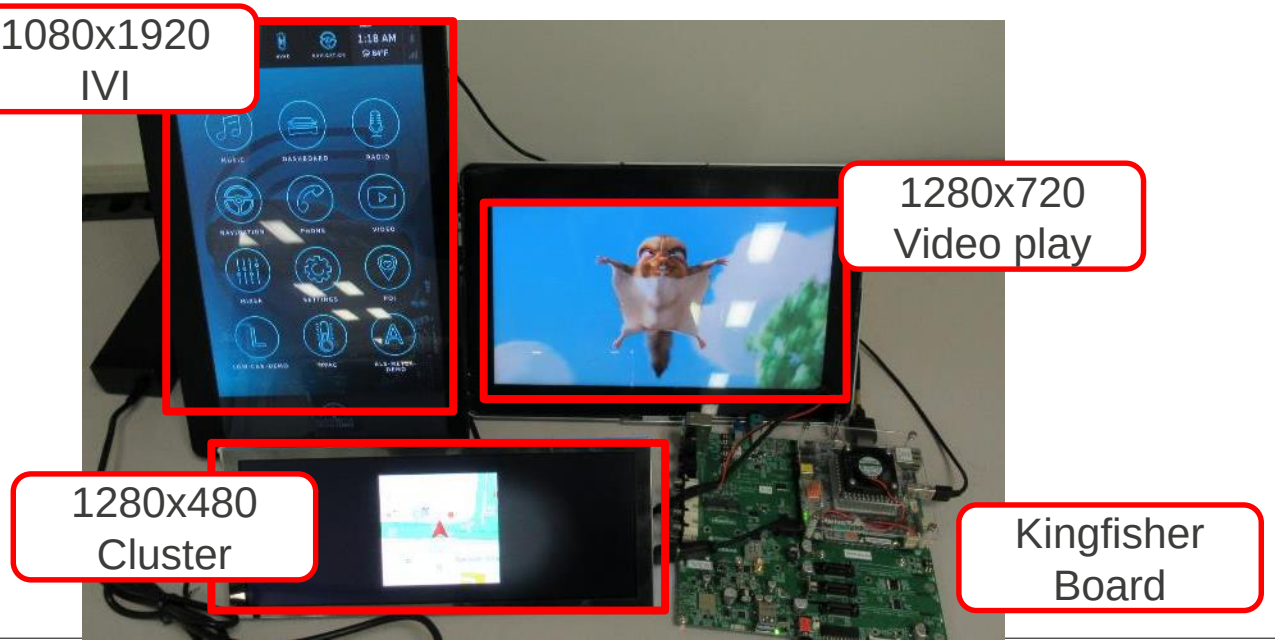
Multiple display for infotainment

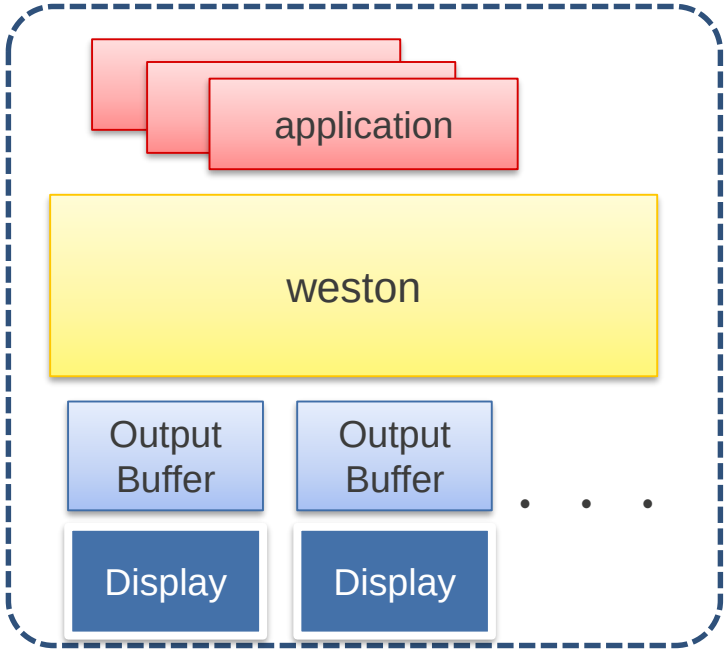
- In the future requirement, multiple display and share multimedia information.



Example for Multi display

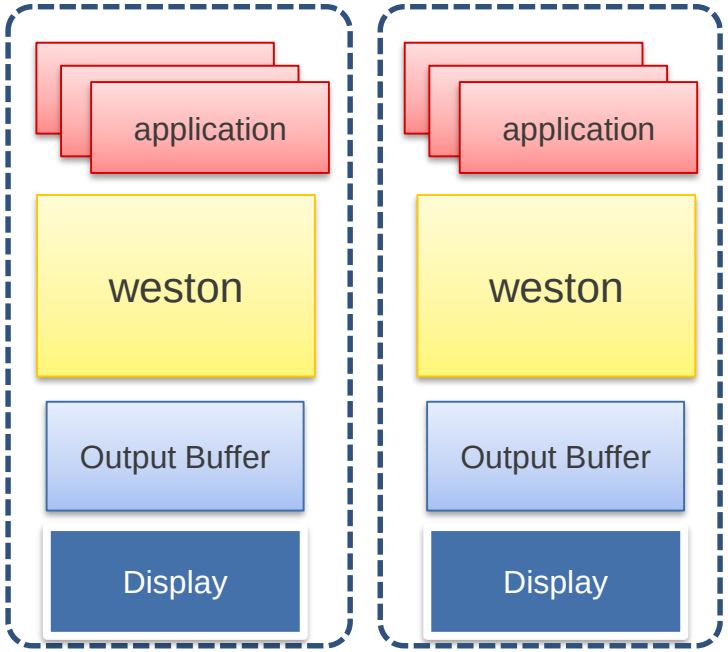
- R-Car reference board Kingfisher has 3 display output (2 HDMI and 1 LVDS)
- One weston controls and manages 3 outputs
- Need high performance and bandwidth in one SoC.





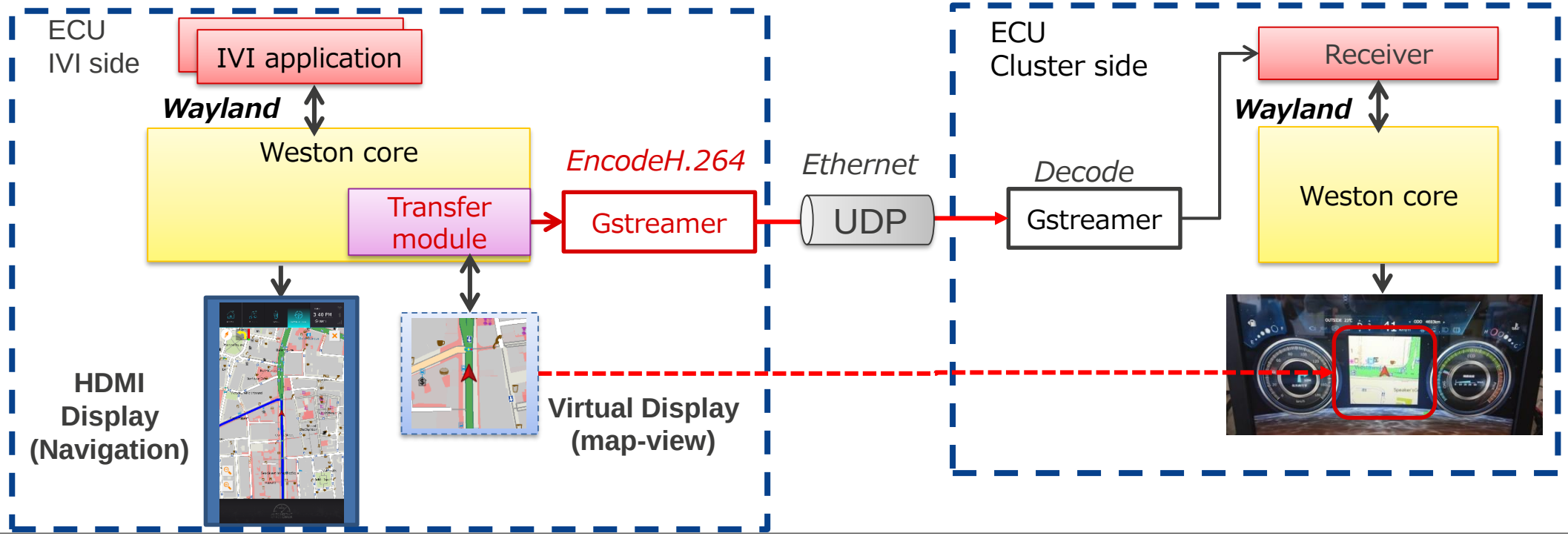
Example for Multi display (AGL CES2018)

- AGL demo use two different board, Renesas (R-Car) and Intel board (minnow)
- Each board has weston.
- Need communicate between ECUs for sharing IVI information (e.g. navigation/map etc.)



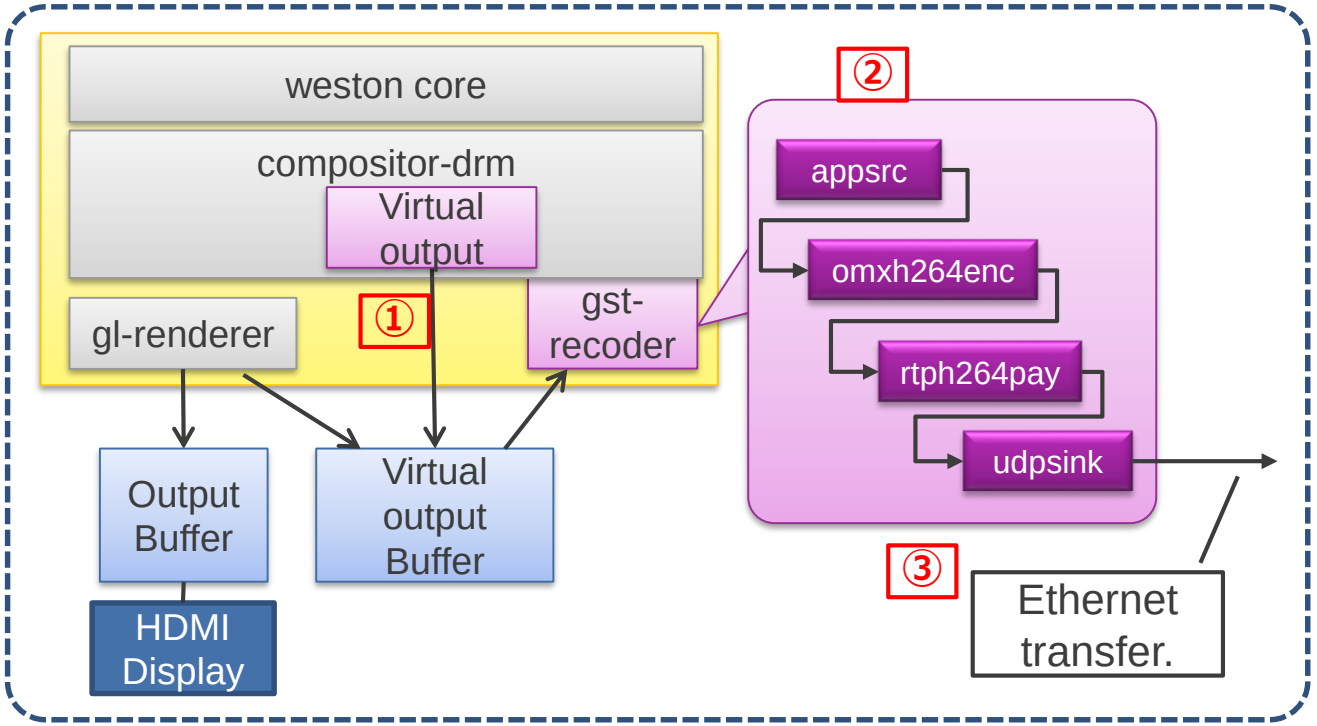
Output sharing between ECU via Ethernet

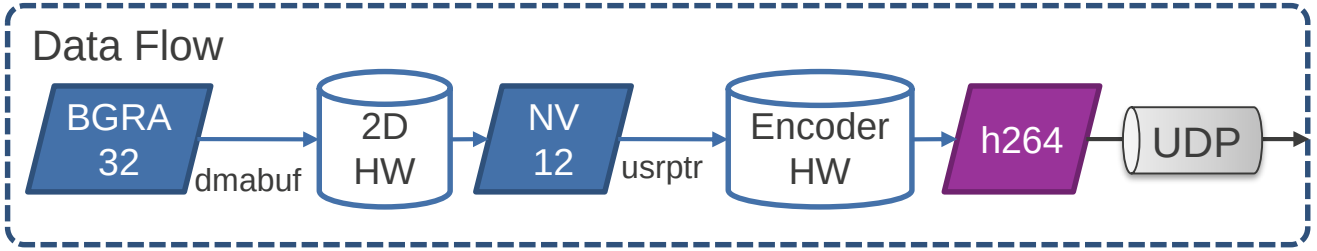
- IVI side transfers image data using H.264 stream (gst-recorder). gst-recoder system has Gstreamer feature in Weston. Receiver gets stream and decode it.



Gst-recorder s/w diagram

- Create “Virtual output Display”.
  - Append “Virtual output” structure as wl_output.
- Encode Virtual output buffer.
  - Read from output Buffer and convert NV12 format. The buffer is read from Encoder HW.
  - 2D-HW can support Cropping(size, position).
- Transfer Encoded buffer
  - Buffer is transferred via Ethernet by udpsink.

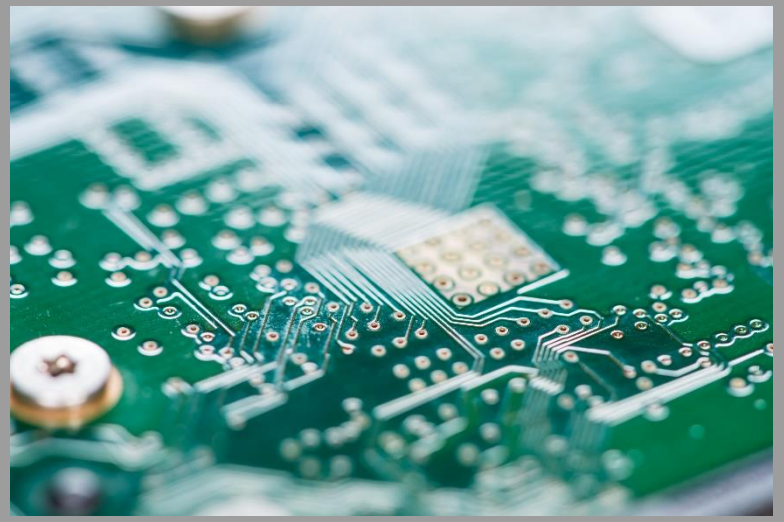




Pros and Cons

- Pros
  - ✓ No modification required to Application. No depend on shell protocol (xdg, ivi).
  - ✓ No modification required to Weston on receiver side.
  - ✓ Video encoding minimizes network data and bandwidth
  - ✓ Virtual display means display size can be made only as large as needed.
  - ✓ No limitation of number of output sharing
- Cons
  - ✓ Delay of about 2-3 vsync to encode, transmit, receive, decode and composite
  - ✓ Parameters must be fixed at boot-up.

3. Usage and customize



Build and Setup in AGL 5.0.3

- Build

- repo and setup : same as usual setup

$ source meta-agl/scripts/aglsetup.sh -m m3ulcb -b build agl-devel agl-demo agl-audio-4a-framework

- Add DISTRO_FEATURES in build/conf/local.conf

```
DISTRO_FEATURES_append = " virtual-display gst-record agl-mapviewer-demo“
```

$ bitbake agl-demo-platform

➡ Update weston.ini file and weston.service (systemd) file

Parameters in weston.ini

Parameter	Type	Description	sample
[core]			
virtual	int	Number of created output	virtual=1
[output]			
name	string	Output name: virtual1, virtual2, …	name=virtual1
mode	string	Output size and fps. width x height @ fsp	mode=800x480@60
ip	string	IP address for receiver side	ip=192.168.20.99
port	int	Port number	port=5005
bitrate	int	Bitrate for encoding	bitrate=100000
recoder	bool	Enable flag	recoder=true
crop	string	(option) : set cropping rectangle width/height and position x/y	crop=384x386@0x0

Board setup example

Sender side

HUB

IP : 192.168.20.93

IP : 192.168.20.99

Receiver side

<weston.ini file>

```
[core]
virtual=1
<snip>

[output]
name=virtual1
mode=384x368@60
ip=192.168.20.99
port=5005
bitrate=100000
recorder=true
```

1) Set modified weston.ini

2) Start weston process by systemd.
Then, add "--gst-record" argument in weston.service.

<weston.service>

```
ExecStart=/usr/bin/weston --idle-time=0
--tty=1 --gst-record
```

1) use default weston.ini.

2) Run gst-launch

```
$ gst-launch-1.0 udpsrc port=5005 ! ¥
  application/x-rtp,media=video,clock-
rate=90000,encoding-name=H264 ! ¥
  rtpjitterbuffer latency=0 ! ¥
  rtph264depay ! h264parse config-
interval=1  disable-passthrough=true ! ¥
  omxh264dec no-reorder=true ! ¥
   waylandsink
```

Demo

Sender side

HUB

IP :
192.168.20.93

IP :
192.168.20.15

1) Run gst-launch

$ gst-launch-1.0 udpsrc port=5006 ! application/x-rtp,media=video,clock-rate=90000,encoding-name=H264 ! rtph264depay ! h264parse config-interval=1 disable-passthrough=true ! decodebin ! autoideosink

4. Current status and Future work

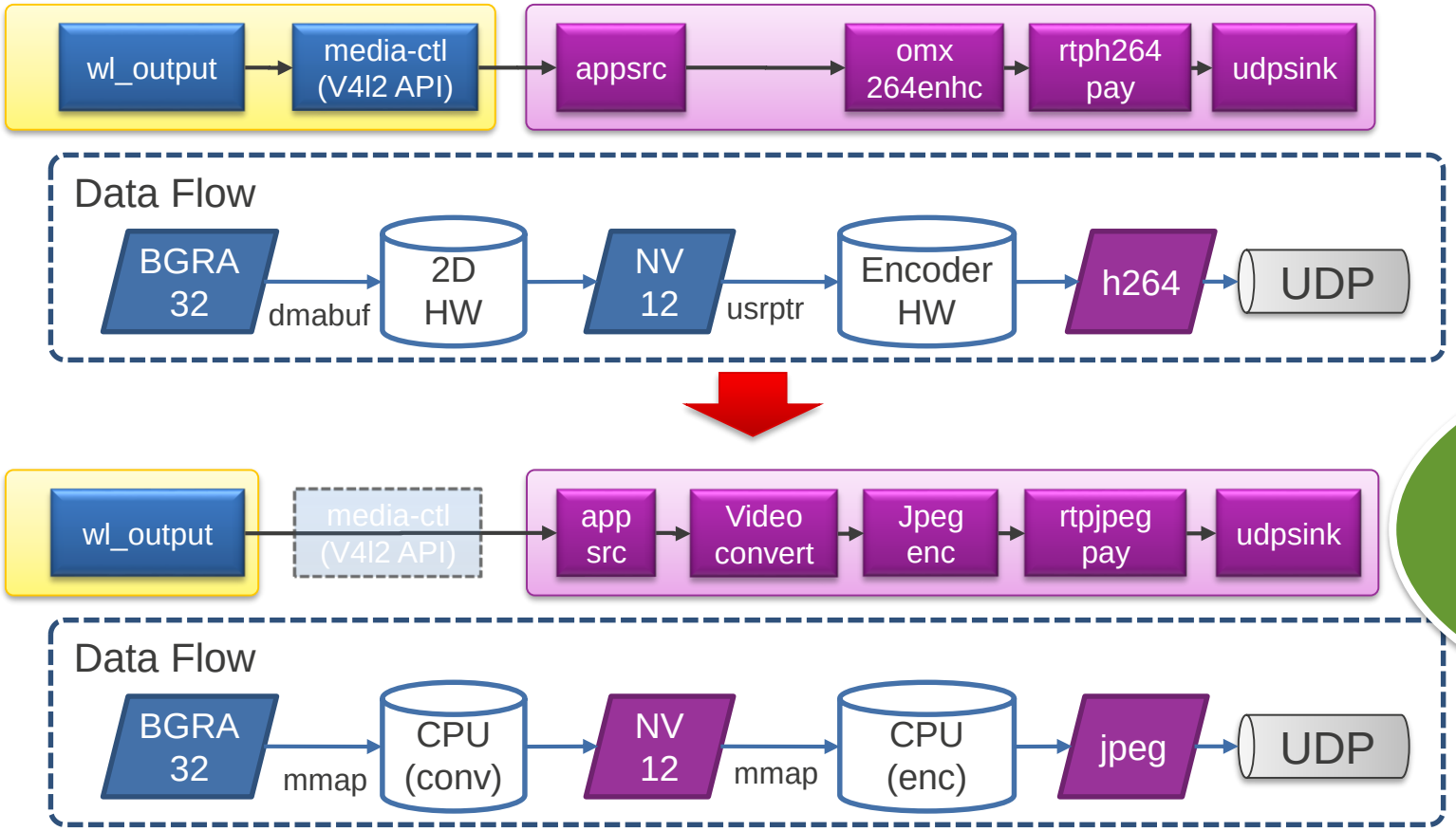
Current work/status

1. Remove R-Car HW depend code : on going.
   1. Test on AGL reference board except R-Car
   2. Push to AGL gerrit. (I want it will merge to AGL 6.0)

2. Upstreaming to Wayland community.
   1. Restructure Plugin APIs
   2. Optimize the performance (zero-copy)

Current work : Remove R-Car specific code

- Independ on R-Car HW specification. Remove v4l2 API and omx element.



Prototype : Done -> Need to test before submit to AGL

Future work : Upstreaming and Optimization

- Upstreaming
  - Restructure to weston/4.0 or later master branch.

- Optimization
  - Replace zero-copy and measure CPU load vsync count.
  - Investigate and apply sync mechanism
- Handling Input event from receiver
  - Need to apply Waltham protocol.

Conclusion

Conclusion

- AGL already supports Output Sharing for Multi Display
  - Renesas provided “gst-recorder” plugin for AGL
  - “gst-recoder” makes remote access feature in Automotive
- Update gst-recorder for multi-platform

- Future work
  - Develop new plugin for upstreaming, and optimization.

BIG IDEAS FOR EVERY SPACE

Renesas.com

Thank you

harunobu.kurokawa.dn@renesas.com

RENESAS

Q & A