AGL Compositor update: Sep 2019

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Hi, I'm Daniel

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Wayland core developer

Open First

Outline and agenda

- Update on compositor/WM progress
- Window manager and shell architecture recap
- Flexible output management
- Future development and input manager

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Update on progress

Compositor/WM progress

- AGL ivi-compositor project created and stood up
- Support for DRM/KMS, Wayland, X11 backends
- Initial home screen ported and available
- Basic window/output management functionality available
- Work beginning to integrate with UCB and make available
- Configured through weston.ini (like old compositor)

https://gitlab.collabora.com/agl/agl-ivi-compositor

Home screen progress

- Current AGL reference UI has ‘all in one’ home screen
- No separation of panels/dialogs/etc into windows at Wayland protocol level
- Ongoing work to separate these out and provide separate surfaces to compositor
- Should be presentable end of September

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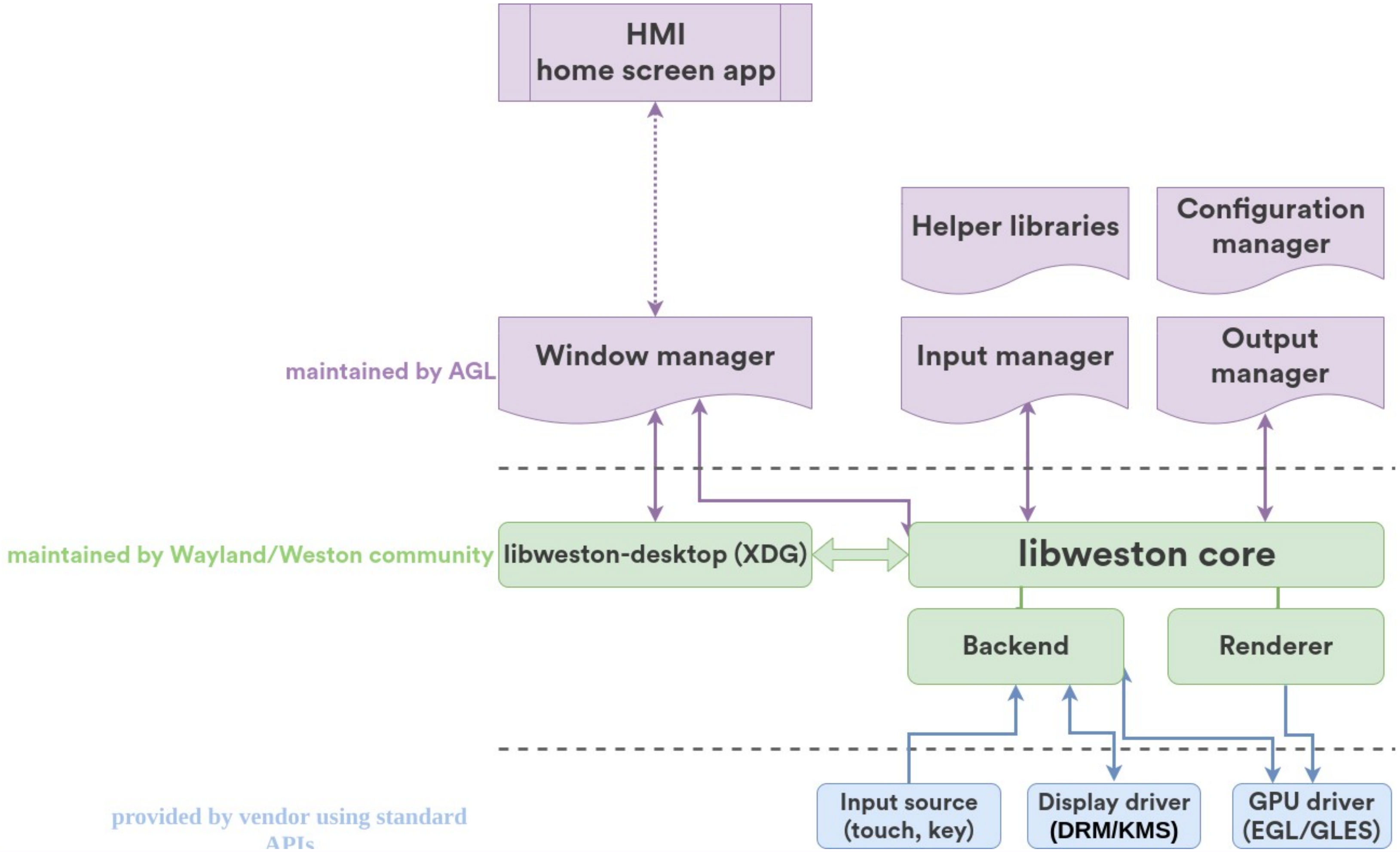
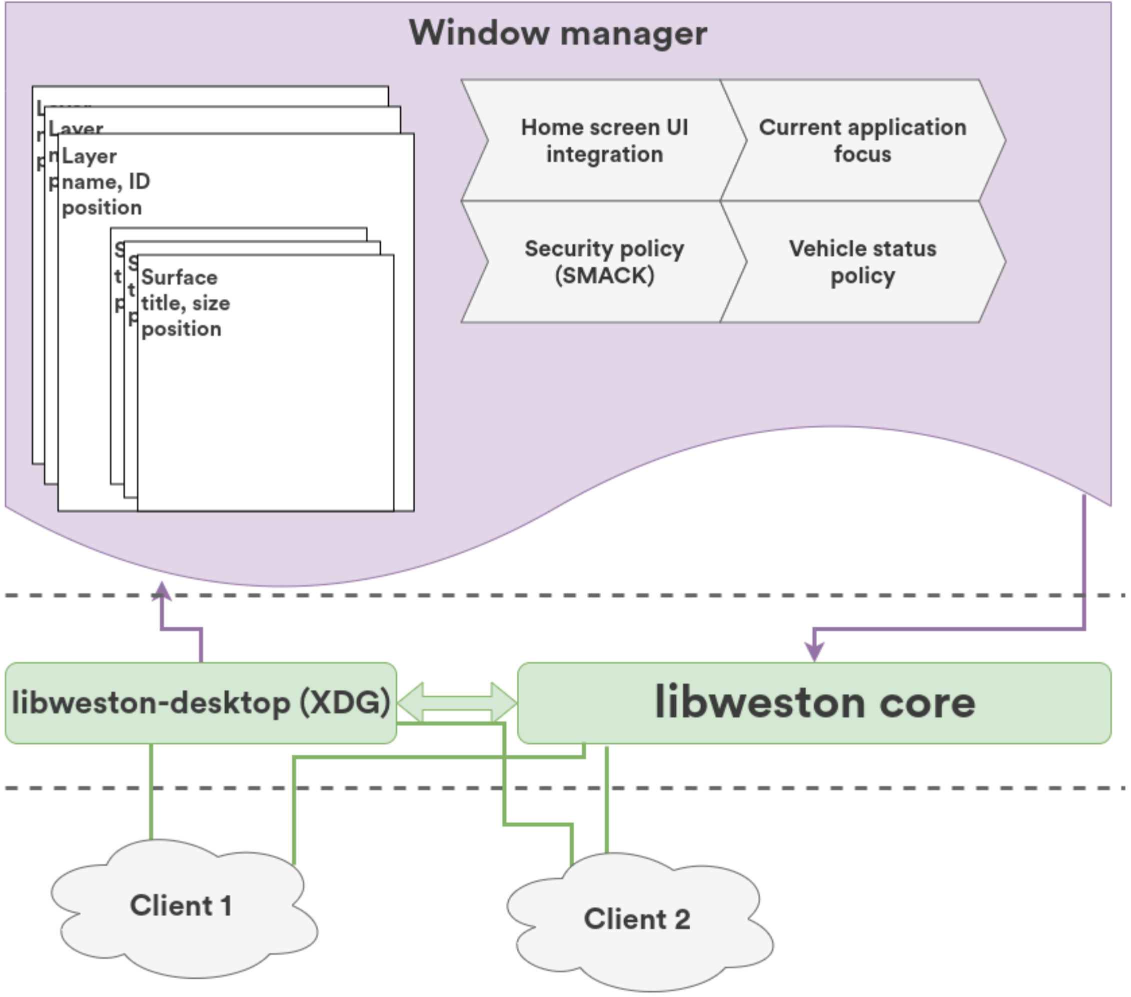
Window management / shell


HMI
home screen app
Helper libraries
Configuration manager
Window manager
Input manager
Output manager
maintained by AGL
maintained by Wayland/Weston community
libweston-desktop (XDG)
libweston core
Backend
Renderer
provided by vendor using standard APIs
Input source (touch, key)
Display driver (DRM/KMS)
GPU driver (EGL/GLES)

Window management concept

- WM based on output/layer/surface (like IVI shell)
- New concept from Weston: surface view
  - Views position an output within a layer
  - Multiple views allow to show surface in different places
  - Crucial for remoting: can create new view for other display or ECU
  - Window manager always controls views!



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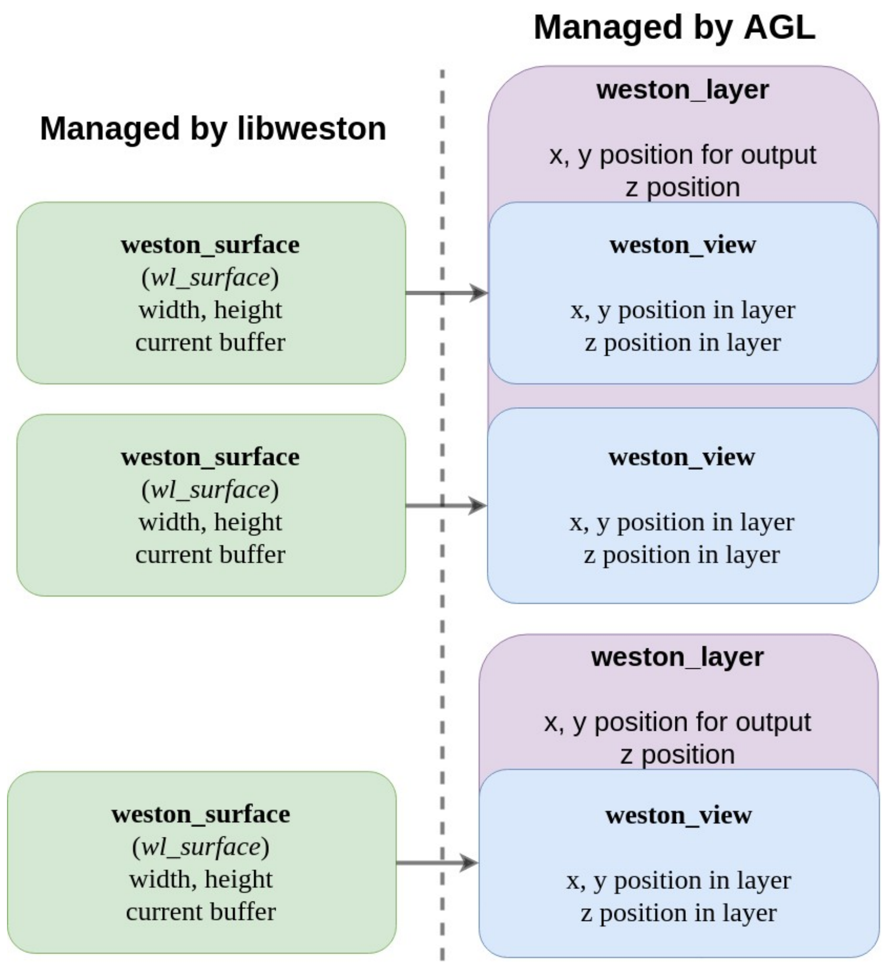
Window management concept

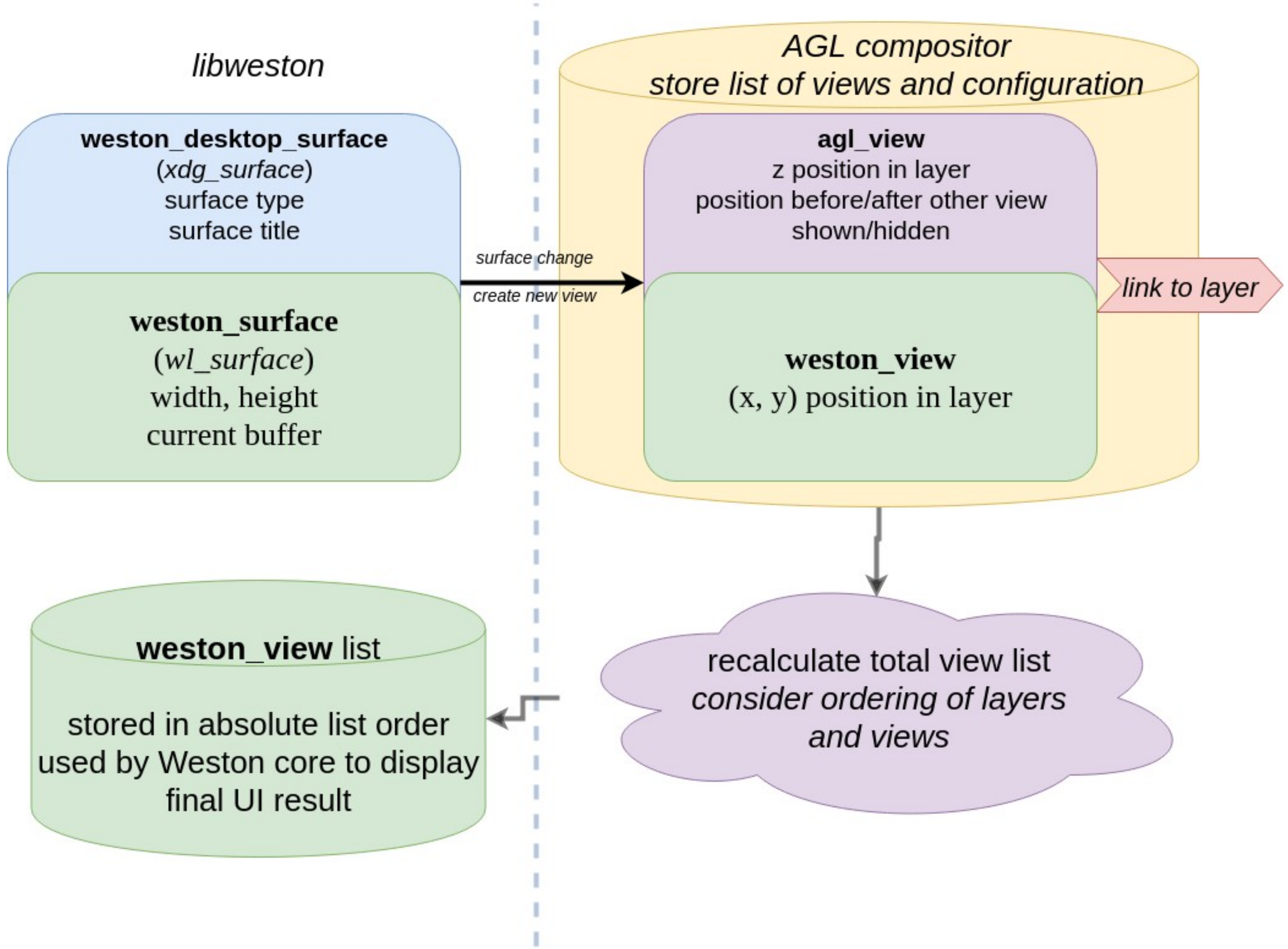
- Not so different from previous IVI shell!
- Key difference: give OEMs power to manage windows themselves with full API
- Offer callback into OEM module for every window event
  - new window created
  - window content updated
  - window removed

Surface/view relationship

- Compositor creates layers for grouping
- Positions layers within compositor space
- Compositor creates views for each surface to display
- Positions views within layers
- AGL IVI compositor API to manage view creation and positioning
- Display of views handled by libweston



Relationship between libweston and AGL views



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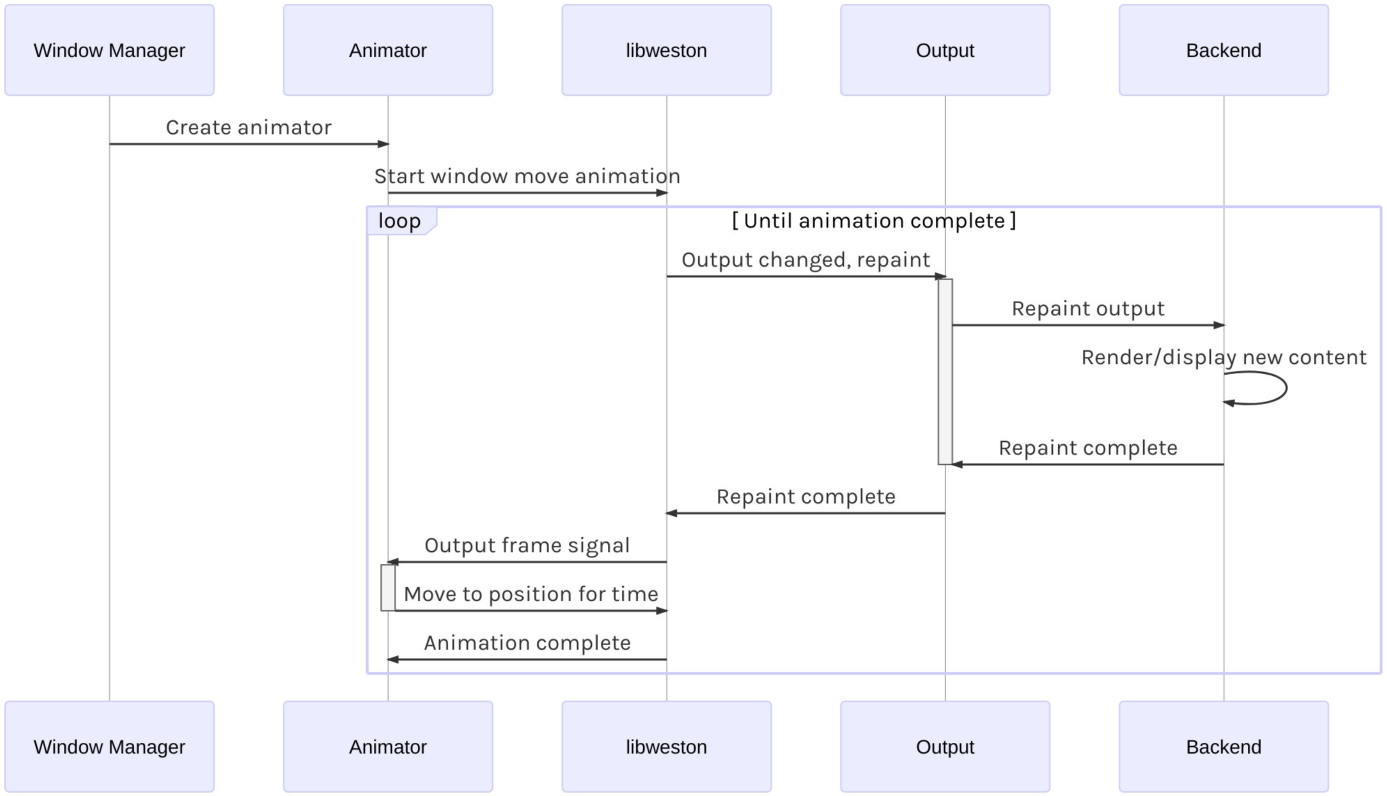
Why two separate lists?

- Keep IVI concept of Z positioning
- Flexible positioning: allow views to be dynamically enabled/ disabled
- Easy integration with OEM WM policy
  - AGL view API can be stable for OEM plugins
- AGL core compositor will maintain translation between two worlds: recalculate libweston list after WM changes

Animation framework integration

- Time-driven animations made available to WM
- Spring physics model provides simple easing
- Parameters are desired end state and time to achieve end state
- Intermediate frames driven by output repaint
- Available animators:
  - Move window
  - Zoom window
  - Fade window opacity

Animation framework example



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Next developments for shell

- Collect additional OEM shell requirements through JIRA
- Example of pop-up dialog content such as warnings or status updates
- Integration with Web Application Manager (see afternoon session)

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Output management

Output management status

- Current output configuration only handled by weston.ini:

```
[output]
name=HDMI-A-1
mode=1920x1080
rotate=270
[output]
name=HDMI-A-2
mode=off
```

Output management status

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```
[output]
name=HDMI-A-1
mode=1920x1080
rotate=270
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name=HDMI-A-2
mode=off
```
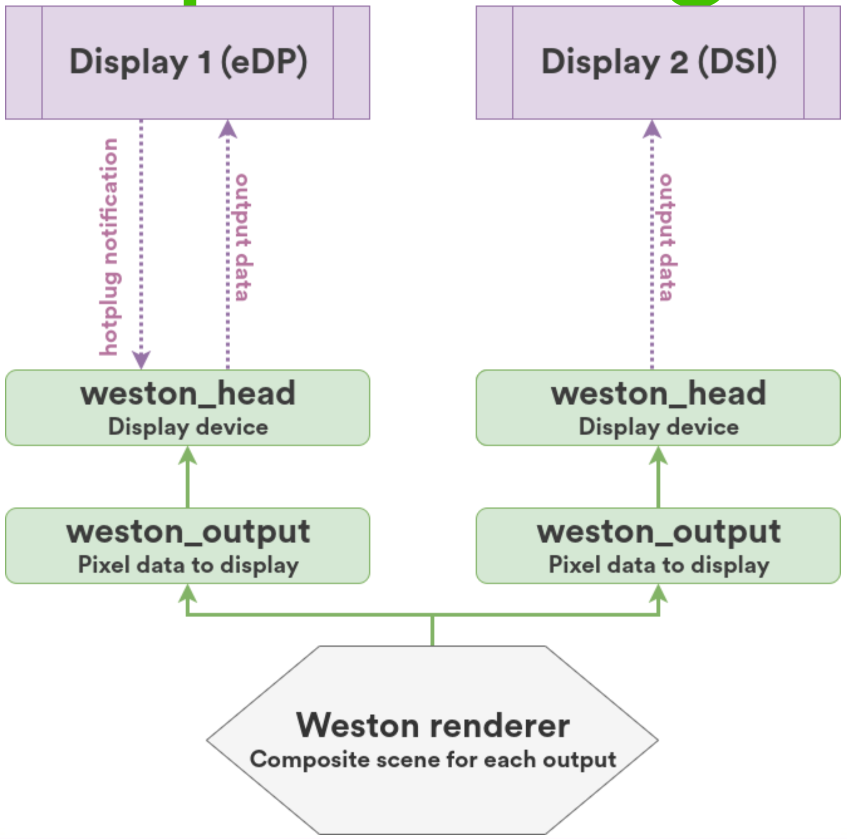

Must be made dynamic!

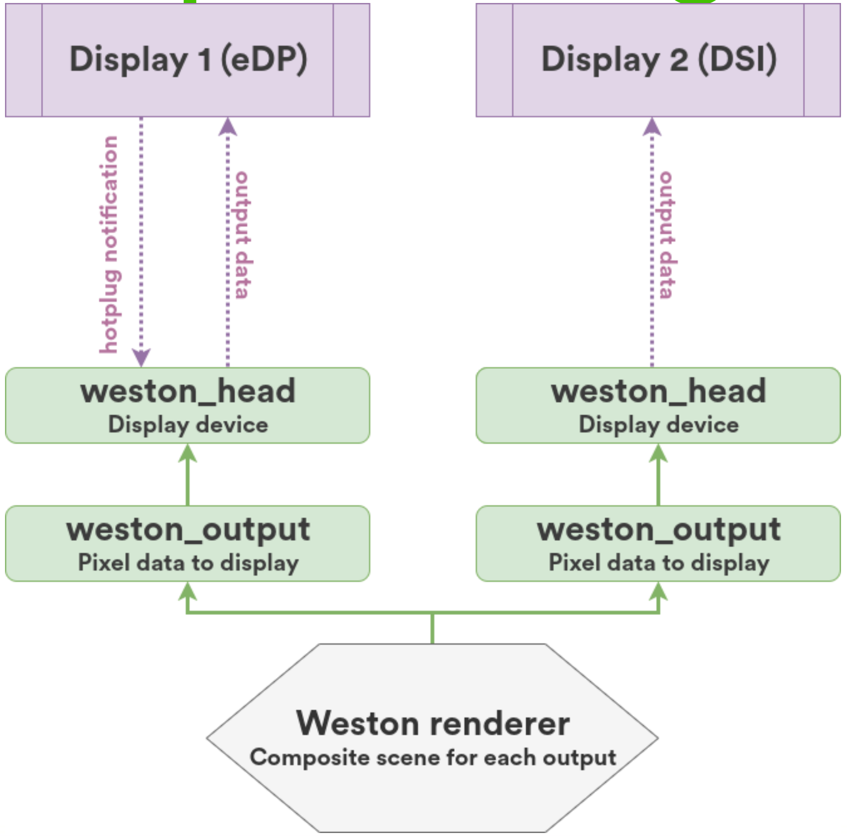
Output manager concepts

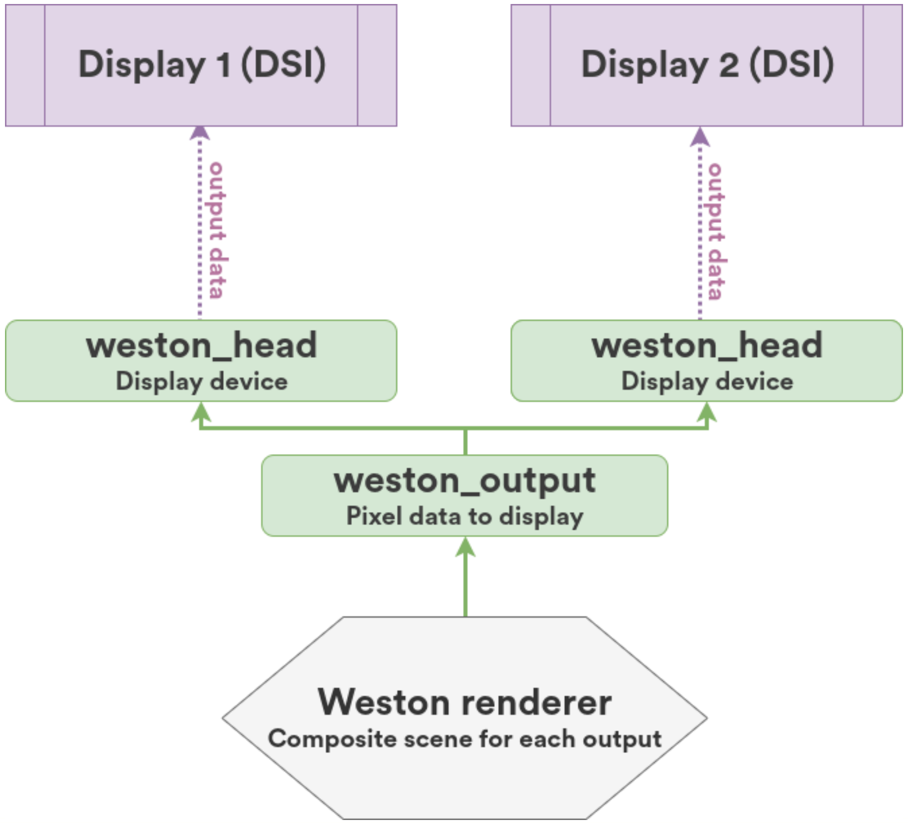
- Based on Weston’s model with separate head/output
- ‘Head’ represents a display device: HDMI, eDP, DSI screens, or virtual output windows
- ‘Output’ represents a grouped area of pixels to be shown on a head
- Fully exposes capability of hardware and system as separate concerns

Output manager concepts



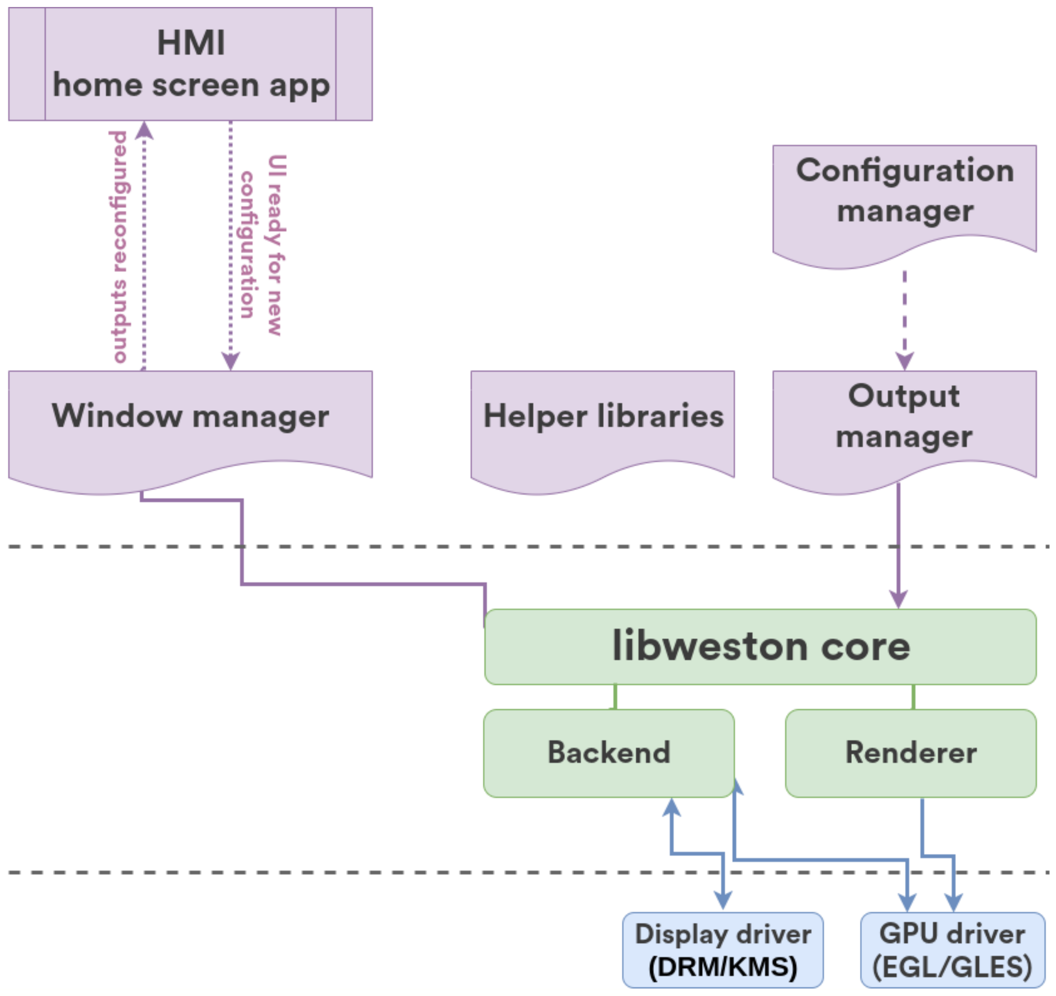
Output manager concepts





Output manager benefits

- Supports complex usecases like clone mode, e.g. all RSE showing same content from one pixel pipe
- Based on runtime dynamic API: window manager can always make policy decisions and change configuration
- Dynamic output management allows for remote displays being added/removed
- Output manager can query head information even if disabled
- Output layout, positioning, etc determined by compositor


HMI
home screen app
outputs reconfigured
UI ready for new configuration
Configuration manager
Window manager
Helper libraries
Output manager
libweston core
Backend
Renderer
Display driver (DRM/KMS)
GPU driver (EGL/GLES)

Output manager API

- List of weston_head available:

```
struct weston_head *head = NULL;
while ((head = weston_compositor_iterate_heads(ivi->compositor, head)))
        /* XXX: do something with head */
```

- Properties available for heads:
  - name
  - connection status (connected, disconnected)
  - available modes (resolution)
  - EDID/CEA display information
  - content protection

Output manager API

- ‘Heads changed’ signal provided via standard Wayland signal/listener mechanism
- Compositor iterates properties of all heads and configures based on policy
- libweston applies new policy
- Further development required for example future complex usecases

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Future development

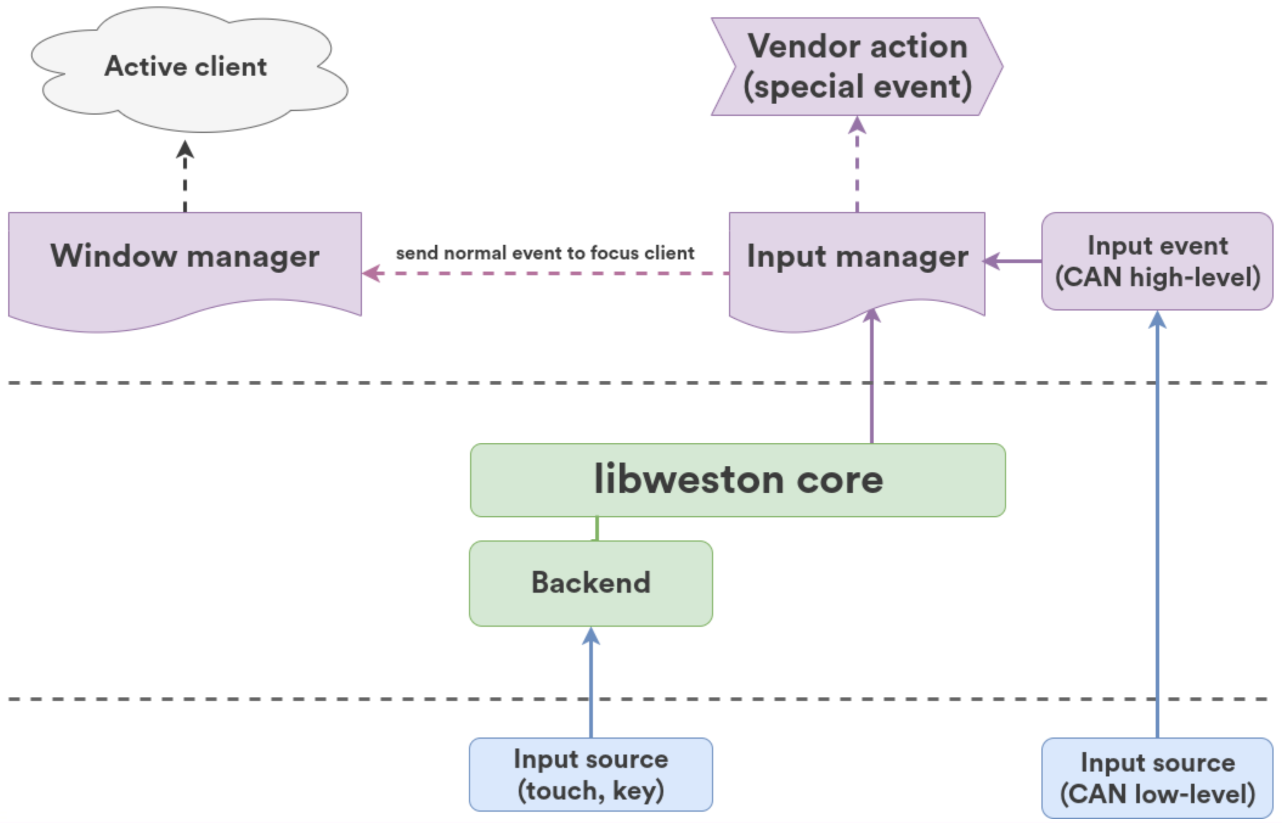
Input bindings: hardkey & CAN

- Input manager currently only supports runtime application of key bindings
- Create helper module adding support for high-level CAN bindings allowing use of CAN inputs
- Create helper module showing example configuration of bindings (e.g. file on disk configuring actions to be taken when keys pressed)

Input bindings: touch gesture

- Touch gesture bindings currently only support set number of fingers
  - Example: three fingers on screen triggers binding
- Add example swipe gesture recognition to allow switching between applications
- Allow gesture navigation to be customised through configuration

Input manager design


Active client
Vendor action (special event)
Window manager
send normal event to focus client
Input manager
Input event (CAN high-level)
libweston core
Backend
Input source (touch, key)
Input source (CAN low-level)

Multiple backend support

- Presently being developed by ADIT with support from Collabora
- Multiple backends to support heterogeneous environment: some output via DRM/KMS, other output into virtualised display (safety-critical/IC domain), other output into remote display (second-screen/RSE)
- Requires capability for multiple simultaneous hardware backends
- Preliminary work being done before upstream

Miscellaneous items

- Support for overlapping outputs: required for efficient virtualisation / remote display to present same content to multiple displays without hardware assistance
- Advanced display configuration: allow shell to prepare UI for reconfigured output before output becomes active
- libwayland integration with SMACK to query client label

CIAT integration

- Much work gone into upstream Weston test suite recently
- GL support for headless renderer designed to allow aggressive testing on development or headless devices
- Not currently integrated with AGL testcases and CI
- After CES demo work complete, develop test plan and integrate tests into AGL infrastructure

Thankyou!

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