



AUTOMOTIVE  
LINUX SUMMIT



# webOS LSM for Automotive

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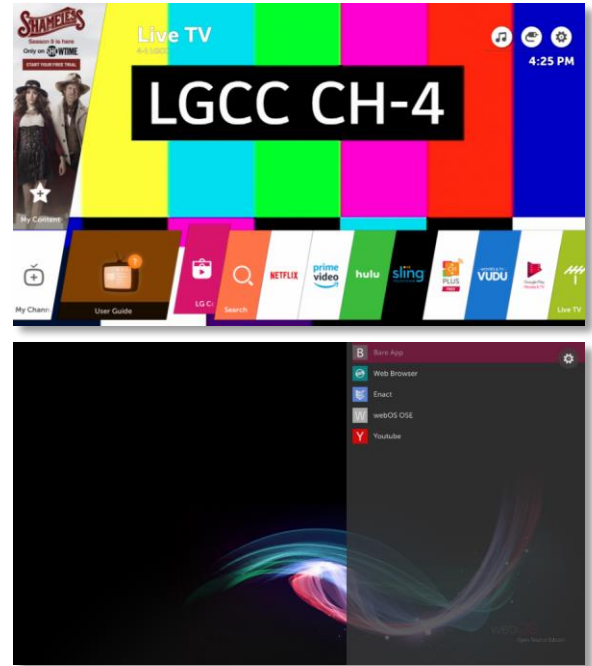


# webOS

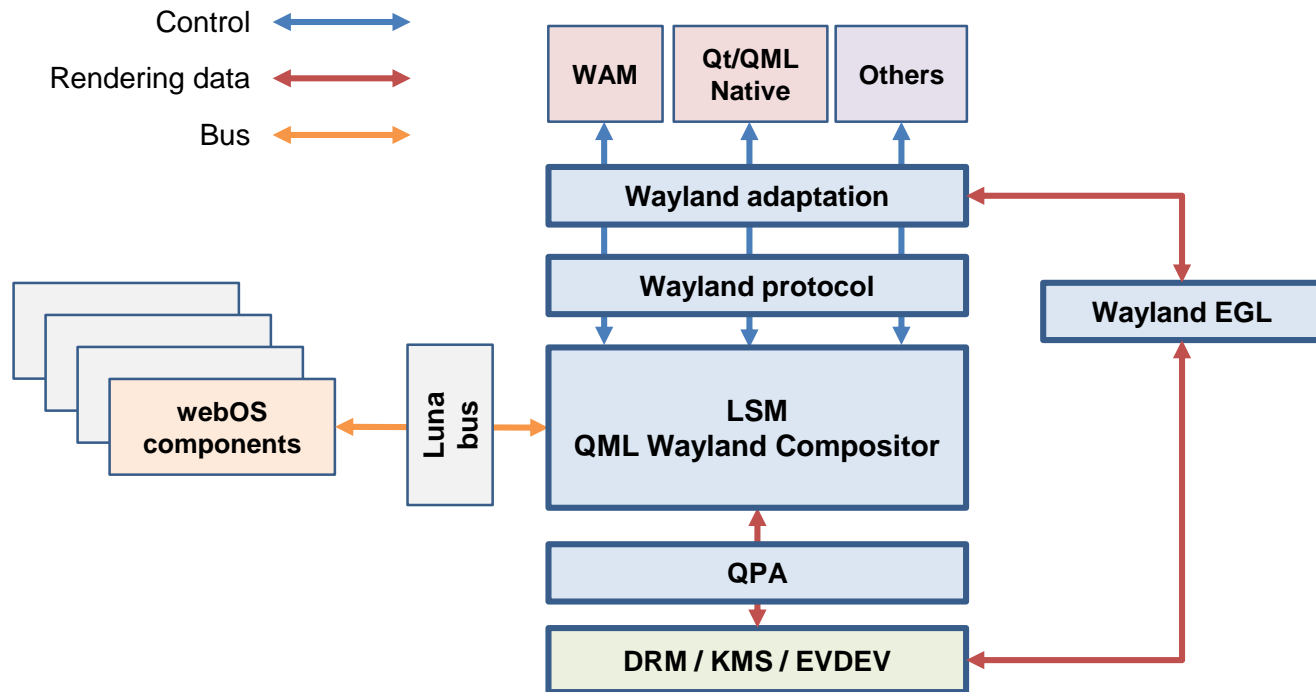


# LSM: Luna Surface Manager

- Window management of application surfaces and System UI
- Input event routing from various devices
- Virtual Keyboard
- Qt/QML Wayland compositor

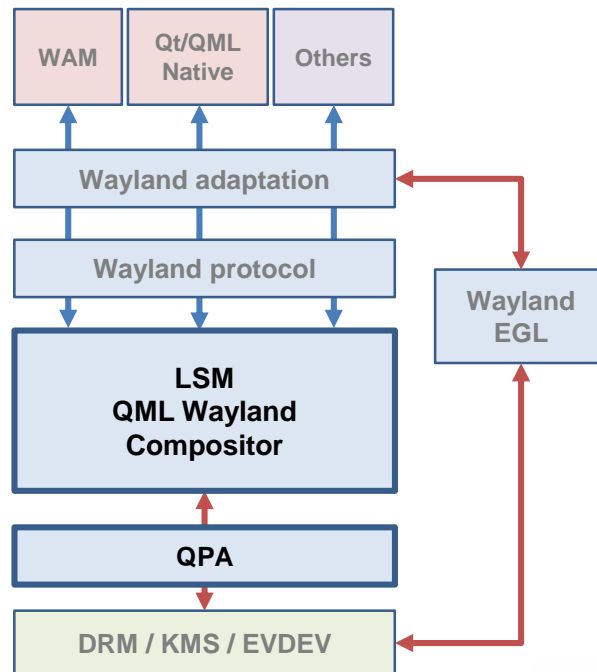


# LSM Architecture



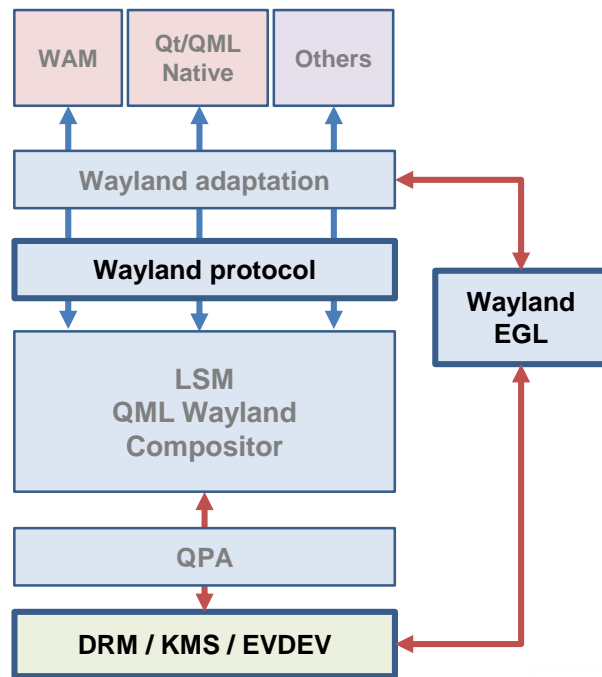
# LSM Core

- QML Wayland Compositor
  - QML application that handles Wayland surfaces
  - Renders system UI elements and Wayland surfaces together
- QPA
  - Platform abstraction plugin in Qt
  - Depends on hardware



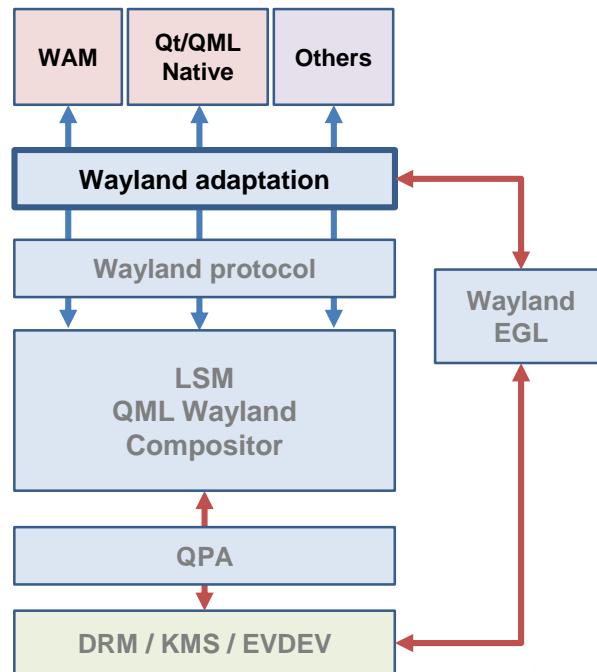
# Wayland and Hardware Integration

- Wayland
  - Display server and client protocol
  - EGL, OpenGL
- Wayland EGL
  - EGL layer for buffer sharing between client and server
- Graphics / Input HW
  - DRM/KMS or SoC specific
  - Evdev or proprietary input stack



# Client Integration

- Various Wayland clients
  - WAM
    - Web app manager
    - Provides Wayland integration for web applications
  - Qt/QML
    - Runs on top of Qtwayland client plugin
  - Others
    - SDL native clients
    - Clients compatible with standard wayland protocol can run



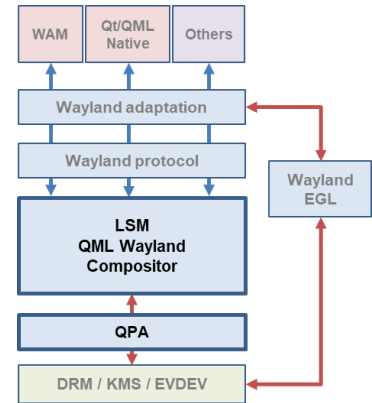
# LSM for Various Products

- Challenges
  - Various GPUs and input devices
  - Extend Wayland protocol while keeping compatibility to standard protocols
  - Commonize core compositor features and modularize extensions
  - Differentiate user interfaces



# Various GPUs and input devices

- Use different QPAs
  - Proprietary QPA for LG in-house SoC
  - Open-sourced QPA
    - eg. EGLFS for DRM-based platforms
- Abstraction for Input devices
  - webOS proprietary input device stack
  - Evdev for EGLFS



# Wayland Protocol Extension

- WebOSCompositorExtension
  - Provides Qt plug-in interfaces to Wayland protocol extension
  - A plug-in that implements a particular Wayland protocol extension can be loaded as needed
  - Defined as a Qt module
    - QT += weboscompositorextension

# Core Compositor and Extensions (1/2)

- Compositor Base Architecture
  - Defines the baseline of webOS compositor and common System UI that can be extended or replaced by a product extension as needed
  - Key architecture
    - Plug-in interface for native core compositor
    - QML module interface that overrides the baseline QML views, controllers and types.

# Core Compositor and Extensions (2/2)

- webOS Compositor Plug-in Interface
  - Plug-in for core class overrides
  - Extend WebOSCoreCompositor and WebOSCompositorWindow so that it can re-implement methods in a product-specific way
- QML Compositor base and Extension
  - WebOSCompositorBase
    - Defines the baseline of QML scene based on the common webOS UX
    - Provides QML types that can be re-defined by a product extension
  - WebOSCompositor
    - Implements product-specific layout of views
    - Re-defines controllers for views including new ones
    - Re-uses types in the baseline unless re-defined

# webOS for Automotive

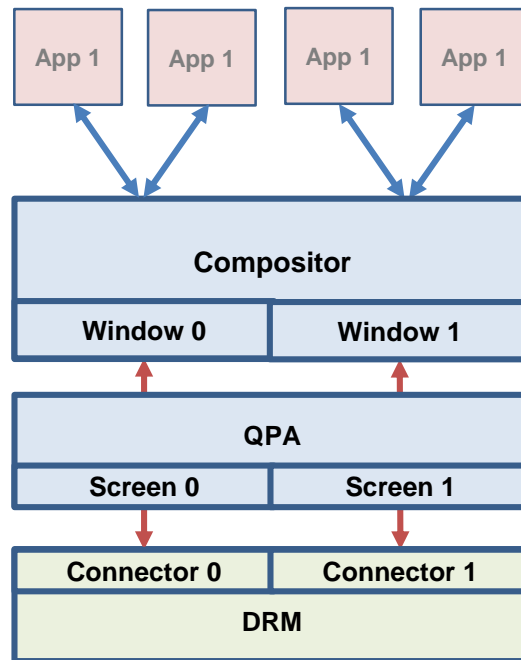
- Automotive Experiences
  - Cluster
  - In-Vehicle Infotainment in Center stack
  - Rear Seat Entertainment
- Specialties of webOS
  - Multiple display supports
  - Quick prototyping of window layouts and system UIs
  - DRM-enabled media stack
  - Integration with Content provider applications
- IVI and RSE

# LSM for IVI and RSE

- Requirements
  - Multiple displays
  - Touchscreen per display
  - Integration with various applications
  - Customizable window layout and system UI

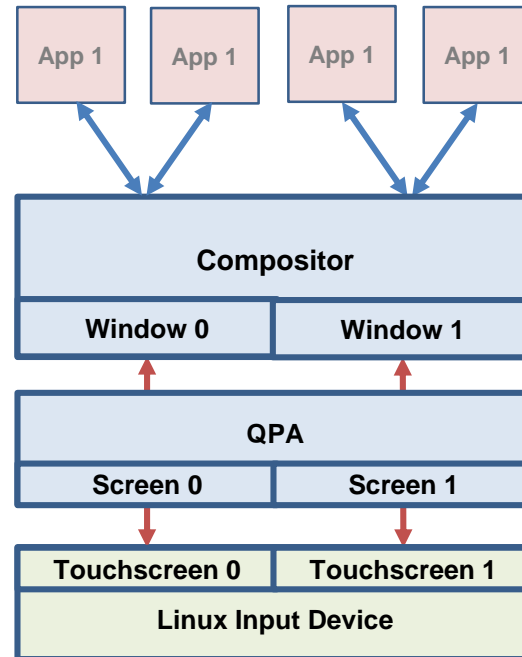
# Multiple Displays

- Hardware interface
  - DRM with multiple connectors
- QPA
  - Platform screens/windows per display
    - DRM connector – Platform screen – Platform window
- Compositor
  - Has multiple compositor windows per display
    - Platform window – compositor window
  - One compositor window covers the screen of the display associated



# Touchscreen per Display

- Hardware interface
  - /dev/input/eventX
- QPA
  - Delivers touch inputs to an associated window
    - Match touchscreen devices to each window
    - Send an event in a local coordinate of the target window
- Compositor
  - Handler events per window





# Apps and System UI

- Integration with Apps
  - Supports various application types
  - Media integration
    - Punch-through
    - Textured video
- Customizable window layout and system UI
  - Custom WebOSCompositor implementation as per spec
  - Reuse common features and UI elements from the compositor base

# Prototype: LSM for IVI



# Prototype: LSM for RSE



# Summary

- webOS is Linux based and open-sourced platform constructed on the flexible and extensible architecture.
- LSM is the Wayland compositor and window manager in webOS that inherits extensibility.
- webOS and LSM have specialties for automotive experiences such as IVI and RSE.



# Find more in

<http://webosose.org>

<https://github.com/webosose>



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