The Chromium project's way to Wayland

Automotive Linux Summit
(May/2017)

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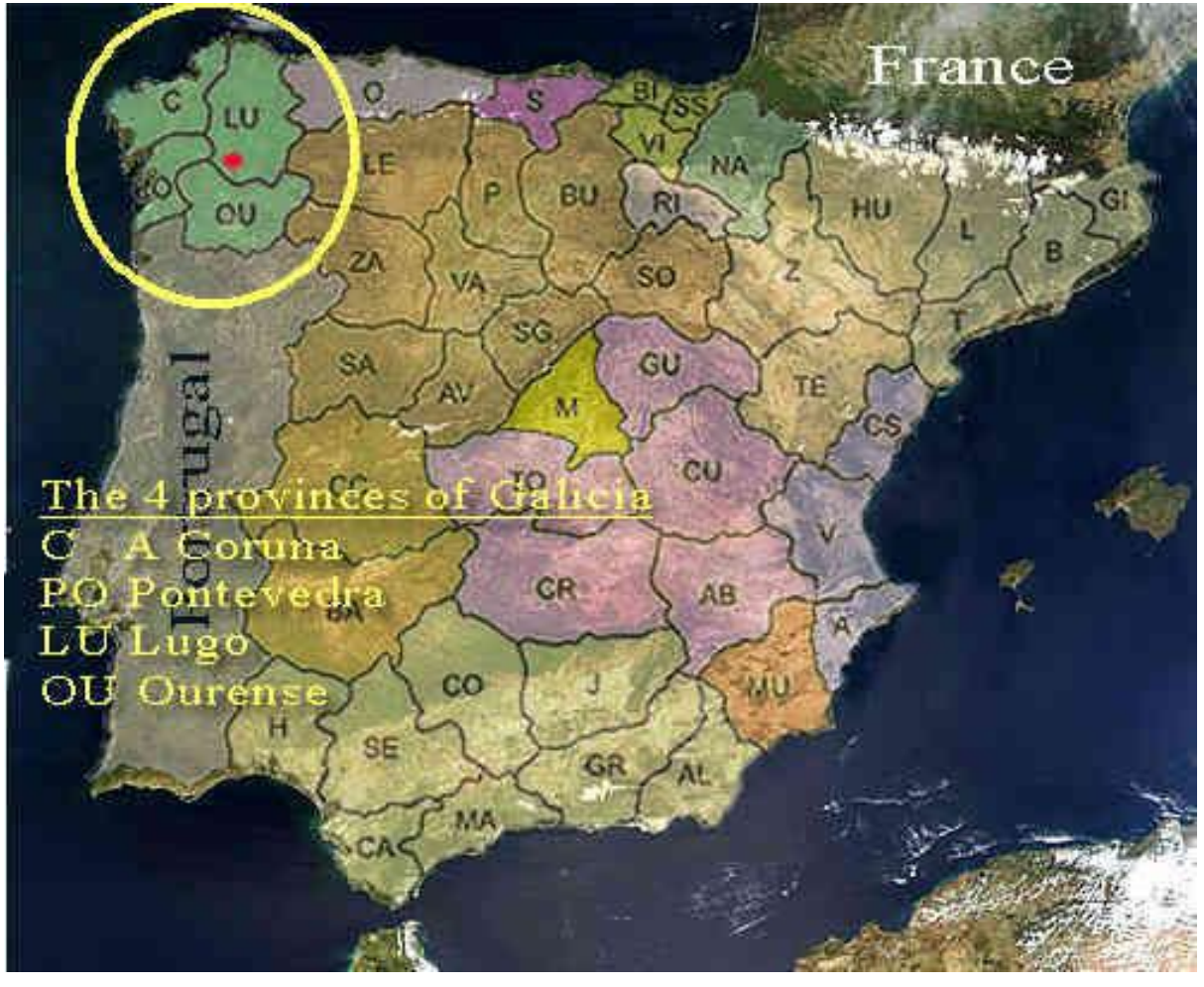
Agenda

- Who is Igalia
- Motivation
- Background
- Developments

Who is Igalia?

- Worker-owned, employee-run Open Source consultancy company, based in Galicia, Spain.



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Who is Igalia?

- ~59 employees around the world.
- Areas
  - **Chromium/Blink**, WebKit and Servo;
  - Compilers, JavaScript engines (V8, JSC);
  - Multimedia, Graphics (Mesa), Networking, Accessibility.

Motivation

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Motivation

- Not a matter of *trend*, but *timing* instead.
  - Maturity.
  - Demand from different industries.

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Motivation

- Being able to run Chromium natively in Wayland-based systems will leverage its adoption in a variety of systems.
  - **AGL**, **GENIVI**, Raspberry Pi, Tizen, Bose, Bosch, Volvo, Jolla.
  - **Fedora 25** is shipping Wayland by default.
  - **Ubuntu 17.10** will? ship Wayland by default.
  - Major GUI Toolkits have built-in support, including Qt 5, Gtk+, Clutter, EFL.

Background

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Background - Ozone/Wayland

- **Ozone/Wayland** (by Intel / 01.org)
  - Aura toolkit: Basic windows, events.
    - ui/views/
  - Ozone project (original)
    - Abstraction layer for the construction of accelerated surfaces underlying the **Aura toolkit**, as well as input devices assignment and event handling.
    - Backends:
      - DRI -> DRM
        - GBM
        - ChromeOS
      - **wayland (off trunk)**
        - **Linux**

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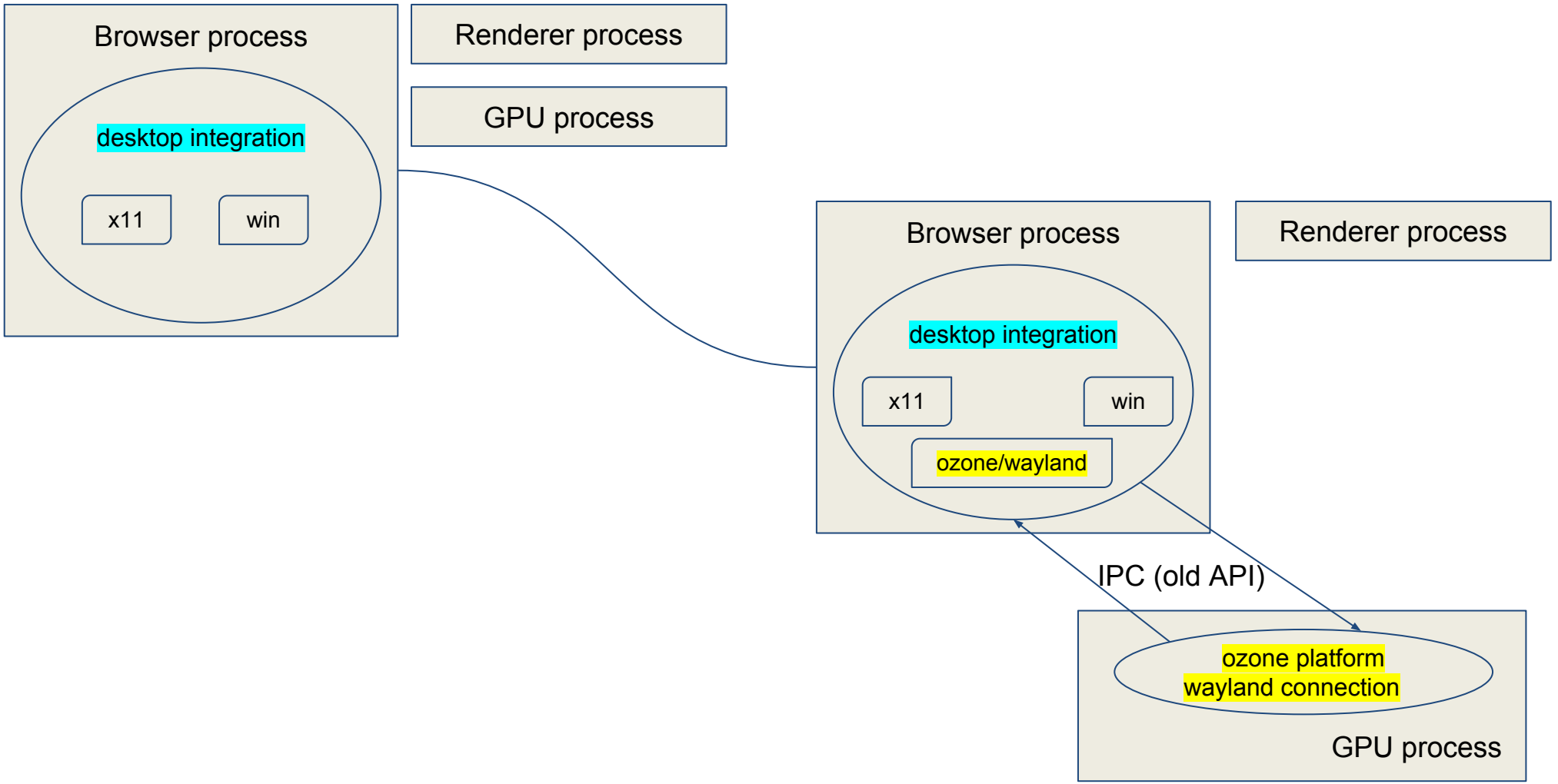
Background - Ozone/Wayland



Background - Ozone/Wayland

- Good community adoption.

- **Project entered in “maintenance mode”**
  - December/2015
  - Chromium m49
    - Today’s trunk is m60

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Background - cr upstream

- In the meanwhile, Ozone layer received two new backends:
  - **wayland**
  - x11
- Is the problem solved?

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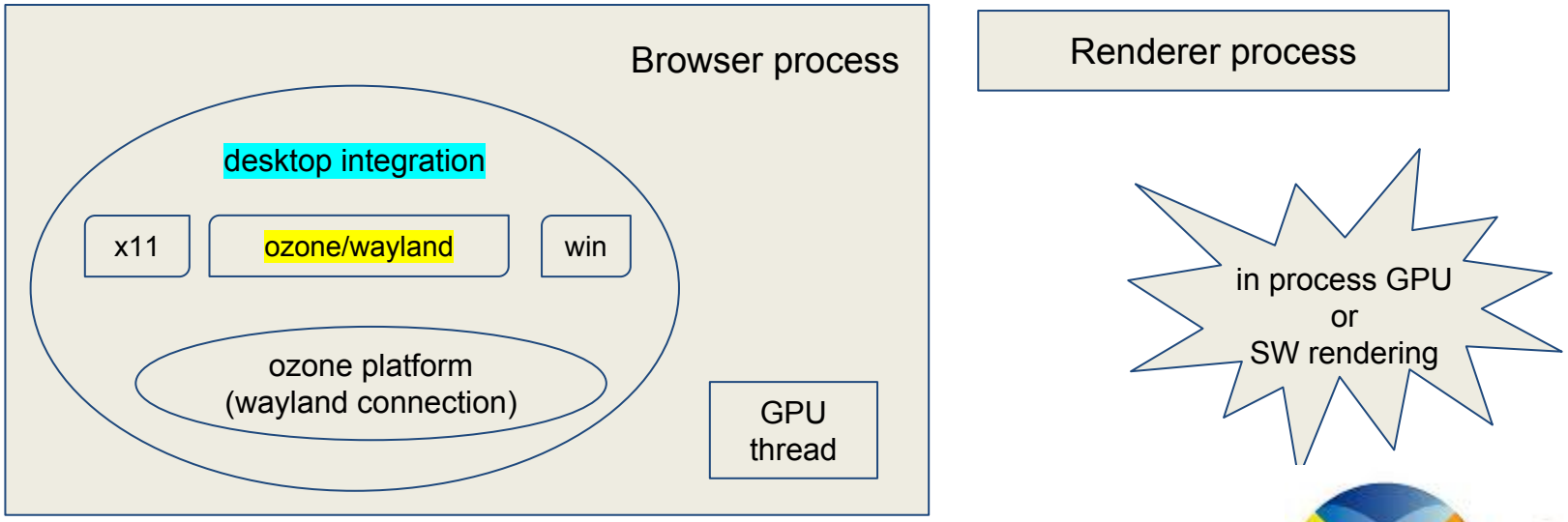
Background

- May/16 – started experimenting with Chromium's Ozone/Wayland.
  - Ported part of the code from 01.org to Chromium ToT.



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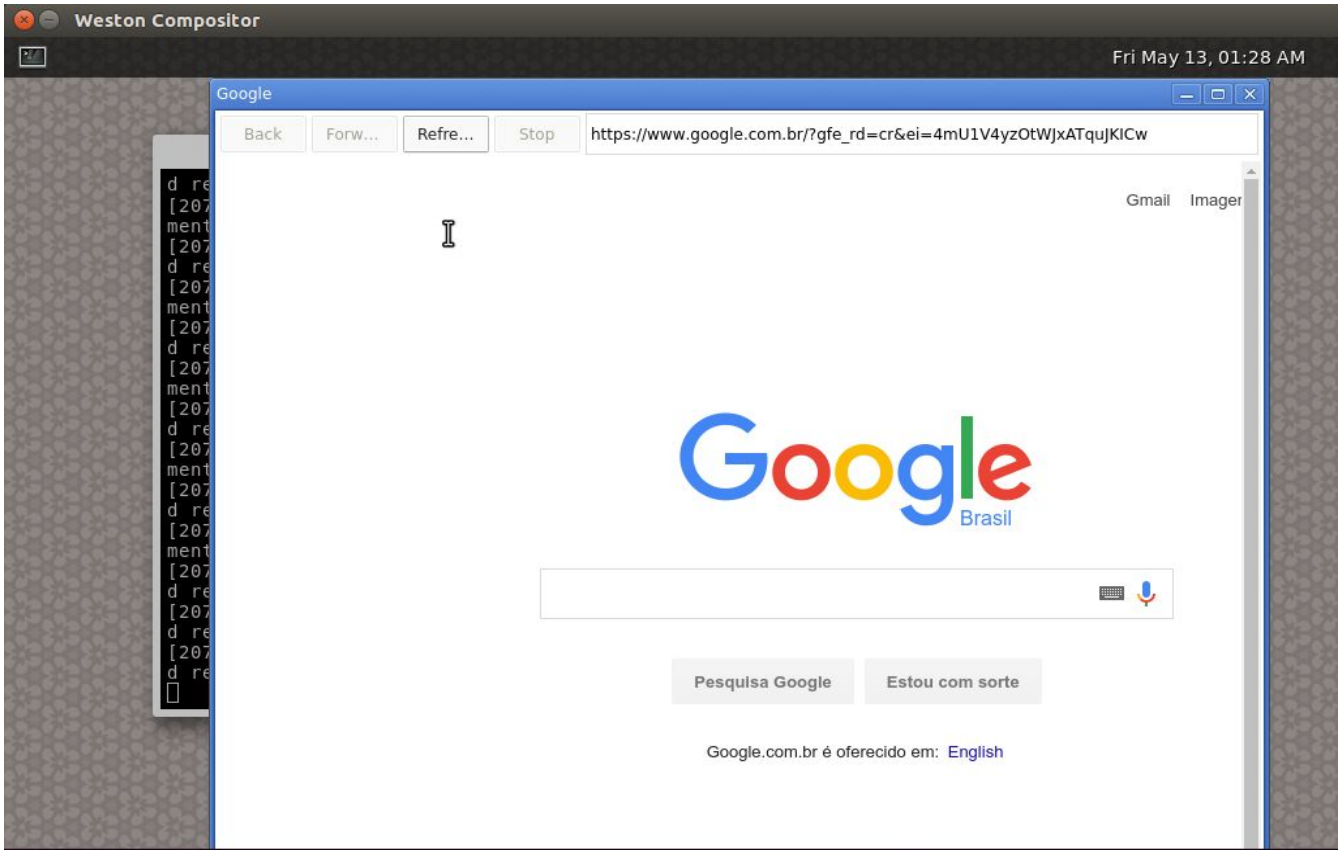
Background

- **content_shell ozone/wayland**



Internal “investment”

Background

- Igalia got in touch with Google/Chromium developers to understand the plans for //ui/ozone/platforms/wayland.
  - “servicification”
  - figured ChromeOS plans for *mus+ash.*
    - Ash
    - Mus (//services/ui/)

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Background

- Ozone project
  - Abstraction layer for the construction of accelerated surfaces underlying the **UI Service** (aka Mus), as well as input devices assignment and event handling.
  - Backends:
    - ChromeOS
      - DRM / GBM
      - **wayland**
      - x11
    - **Linux**

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Background

- The original “desktop integration” approach taken in **Ozone/Wayland** did not comply with the way future Linux desktop Chrome was foreseen.

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New developments

Phase 1 - The bring up

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Phase 1 - status check

- Prior to Sept/16
  - Chromium ToT had a Wayland backend of Ozone.
    - Partial upstream.
      - still behind in terms of functionality if compared against Intel's implementation.
    - ChromeOS / mus+ash oriented.
    - Outdated Ozone documentation.
    - Limited buildbot coverage.

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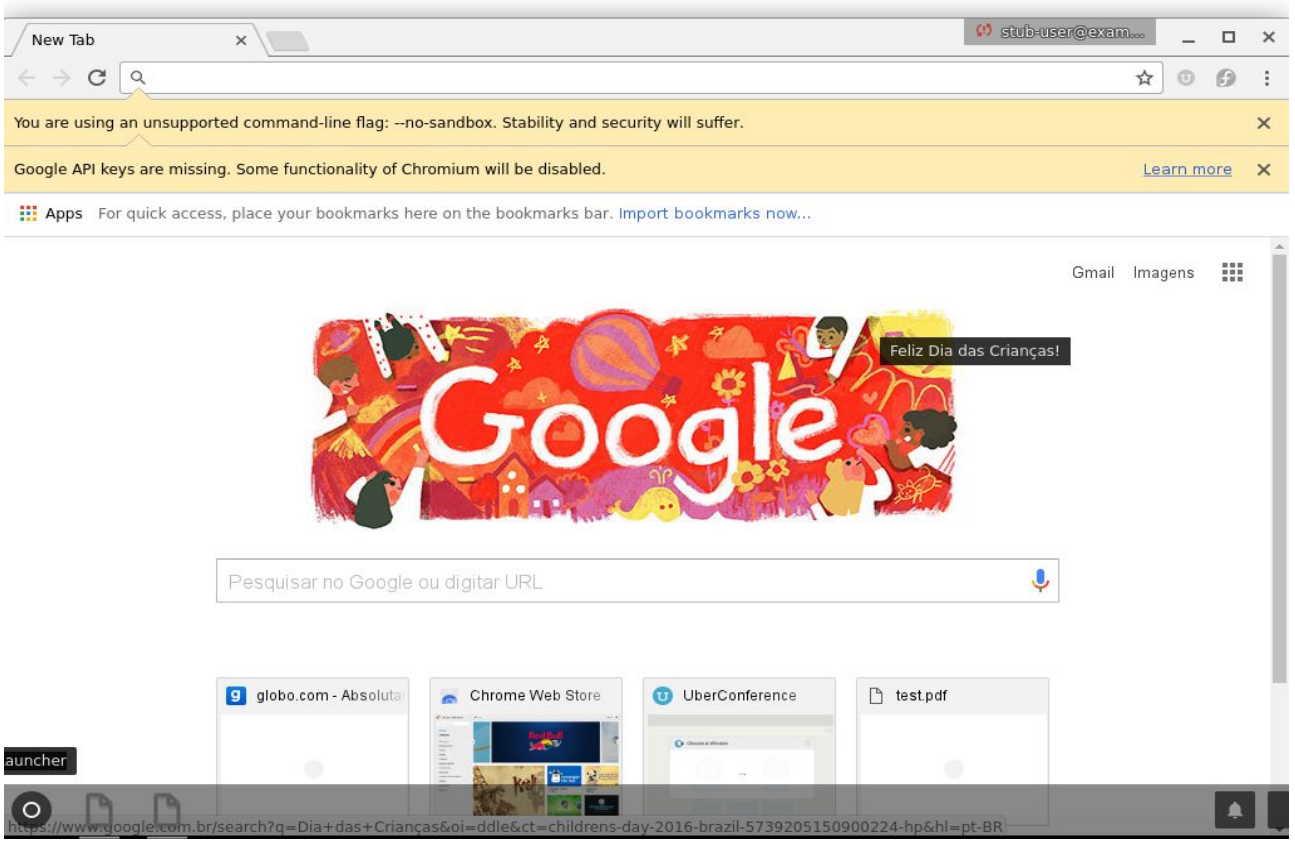
Phase 1 - the bring up

- Sept-Oct/16
  - Igalia brought up of Ozone's Wayland backend in ToT.
  - Start experimenting with "Ozone != ChromeOS".
- Documentation
- Buildbots



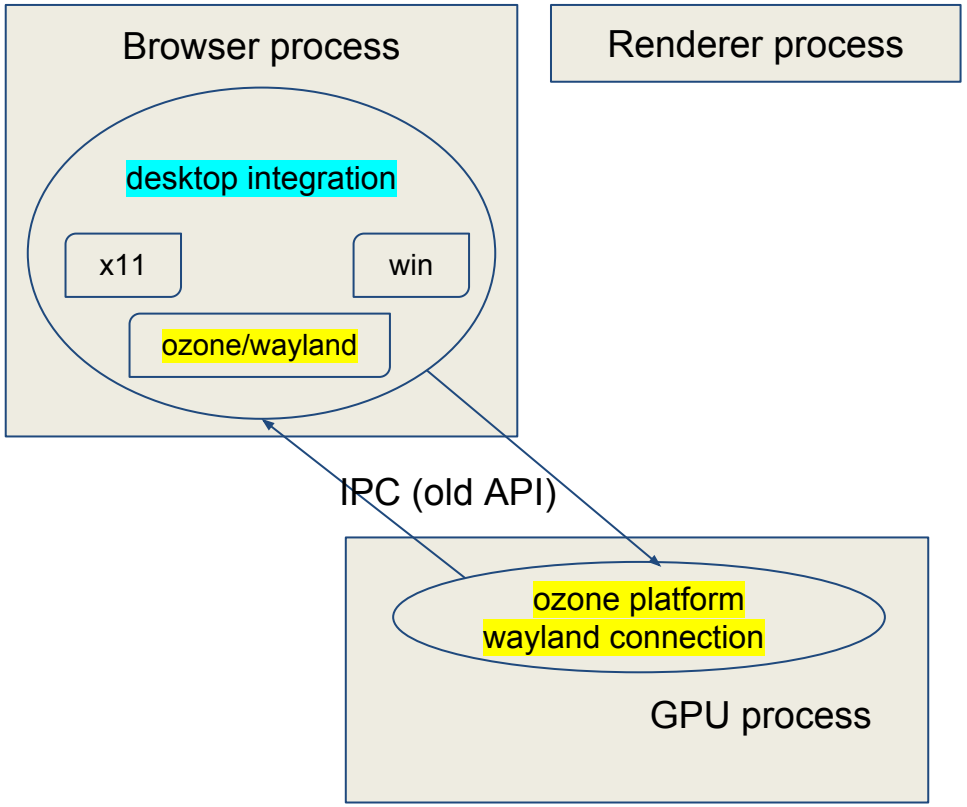
- Design discussions with Robert Kroeger (Google).

Phase 1 - demo

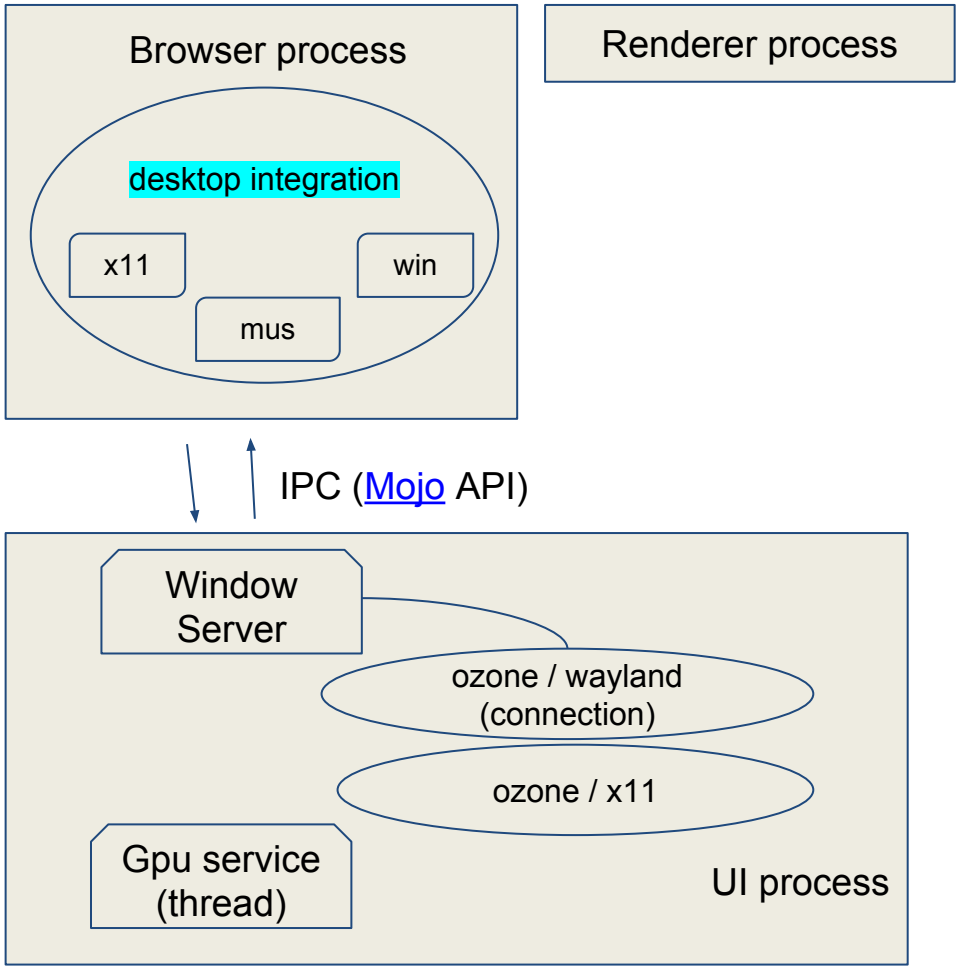
- Nov-Dec/16
  - CES demo: Linux/AGL/Wayland on R-Car M3

Phase 1 - Desktop integration

Linux desktop integration (01.org)



Mus Linux desktop integration



New developments

Phase 2 - Chrome / Mus

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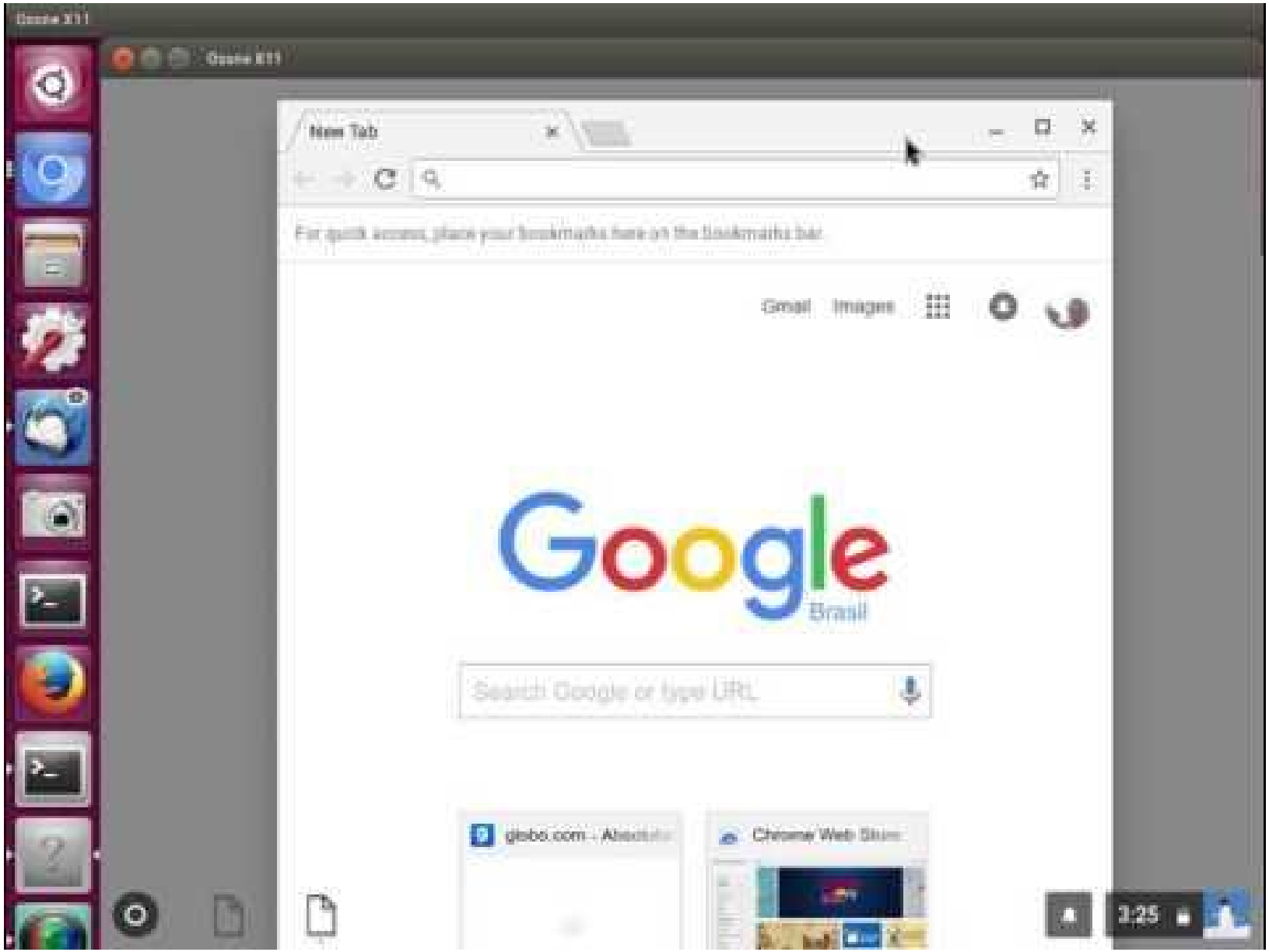
Phase 2 - ChromeOS

- CrOS has a Window Manager (WM) and a ScreenManager (SM).
- *acceleratedWidget* paired with a display (physical).
  - SM changes *acceleratedWidgets* (e.g. display resolution change).

- **Internal-window mode**
  - All the aura windows in the system end up sharing a single display.
  - Chrome aura and other app windows are embedded within a single top-level *acceleratedWidget*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Phase 2 - Desktop Chrome

- Desktop Chrome has no SM.
- Desktop Chrome has no WM.
  - One *acceleratedWidget* per Chrome window.
  - User manipulates *acceleratedWidgets* via the host OS window.
    - maximize, minimize, dragging.

- **External-window mode**
  - Modify Chrome and Mus so that Mus creates native *acceleratedWidget*'s for each top-level mus window.
  - chrome/mus.

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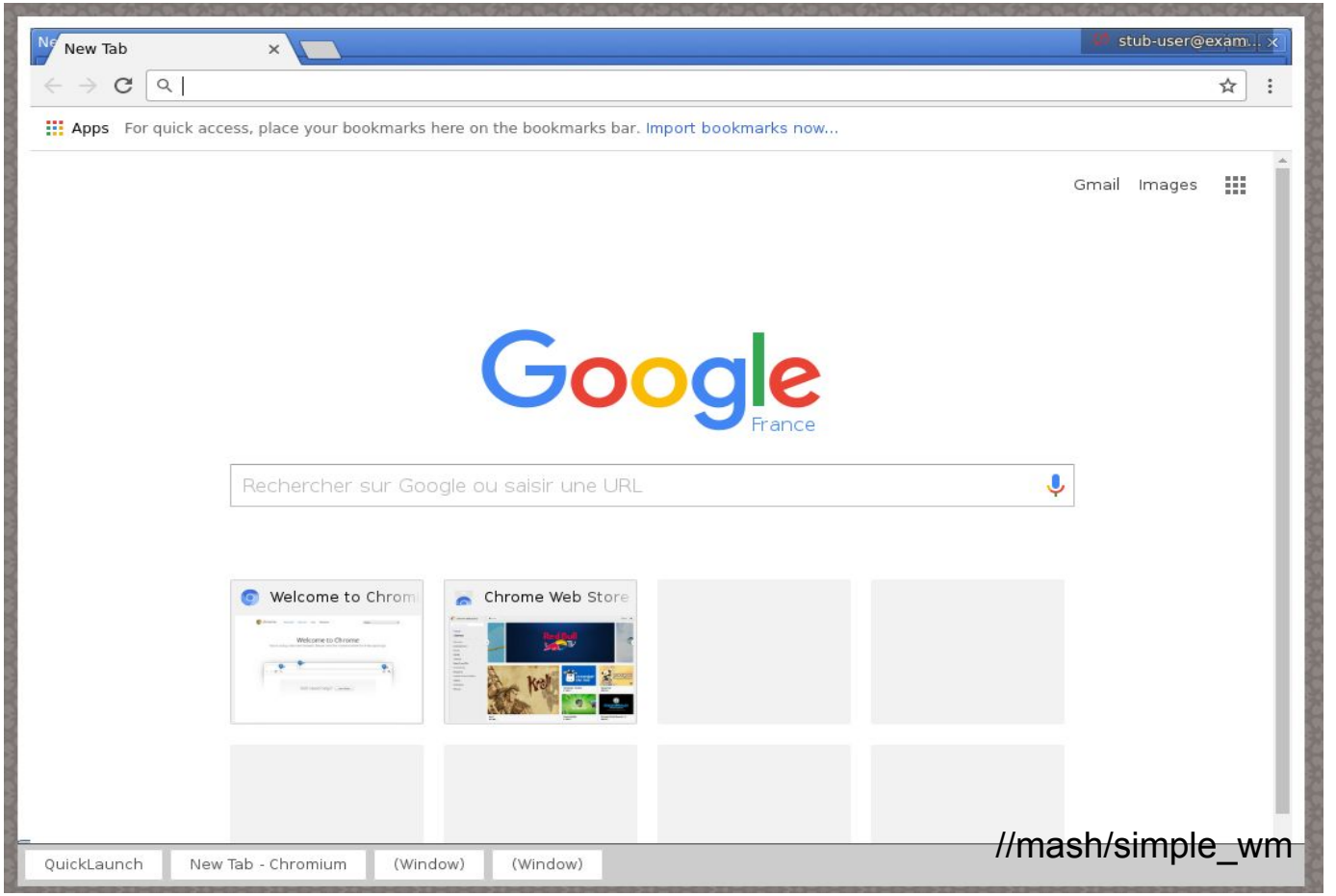
Phase 2 - Dilemma

- **Cut the assumptions that there is SM and WM?**
- **Fake a WM?**
  Chrome is the WM?



Idea 1: Extending internal win mode

- Original plan proposed for ‘external window’ mode:
  - Create a new “desktop-stub” replacement for Ash?
  - Desktop integration.
    - In essence, a subset of functionality currently provided by Ash is delegated to the native window system.
  - Considering using //src/mash/simple_wm as starting point?

After talking to rjkroege@, sky@, we agreed that this is not the best way to approach to tackle the issue. Alternatively, sky@ proposed to work this out directly on LinuxOS/Ozone builds.

Idea 2: Mus' External Window Mode

- **Extend Mus and Ozone** to support 'External Window' mode.
  - Generalize ChromeOS assumptions.

- No major functionality loss if compared to stock Chromium.

Mus' External Window Mode - breakdown

- Extend the *mus_demo* to work in 'external window' mode.
- Rework internal window mode assumptions in the code
  - 1:1 relation of ws::Display and display::Display.
- Extend Mus to support 'external window mode'.
- Extend Ozone to work on 'external window' mode.
- Make the code that handles the existing **–mus** command line parameter non-ChromeOS specific.
  - Chrome today launches the same way it ought to, for Chrome/Mus.

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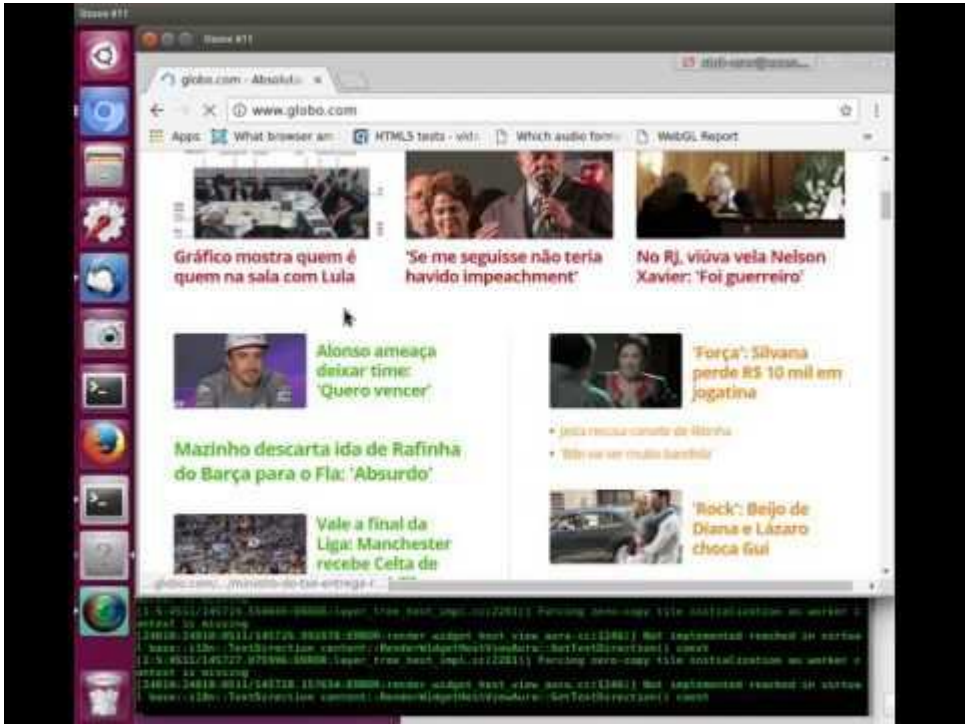
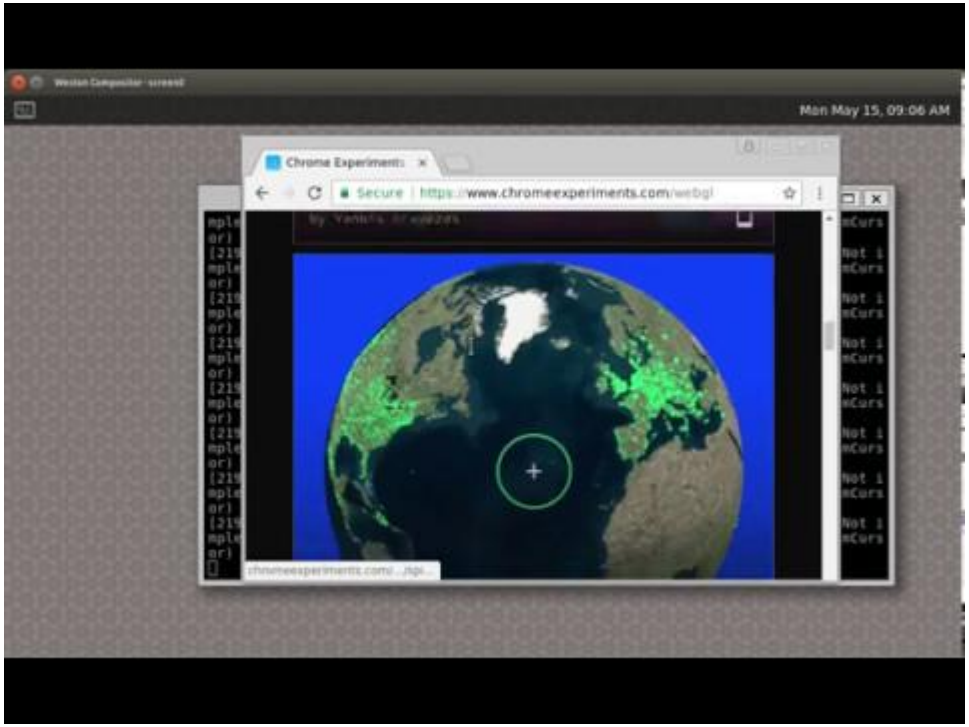
Mus' External Window Mode - Status

- What is the status today?
  - Very functional and promising, but WIP.





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Mus' External Window Mode - The project

- The project is being hosted on GitHub.
  - well defined contribution policy:
    - peer review.
    - Build bot running existing tests
      - *mus_demo_unittests* (extended to launch multiple windows).
      - *mus_ws_unittests*.
- Rebase strategy
  - Igalia's excellence in carrying forks of downstream project forward.
  - Weekly rebases.
  - Continuous history clean up.
- Periodic sync up with Google.

Mus' External Window Mode - Status

- Today (Chromium ToT):
  - Ozone implies ChromeOS.
    - mus+ash == ChromeOS

- Today (GitHub):
  - Ozone runs on both ChromeOS and LinuxOS
    - mash (ChromeOS + internal window mode).
    - mus (LinuxOS + external window mode).

Mus' External Window Mode - TODO

- Continue to fix the windowing integration when Chromium's builtin window decorations are used.
  - window resize and dragging.
- Fix drag and drop.
- Fix clipboard (it works as in internal window mode).
- Support newer shell protocols
  - e.g.: **XDG v6**, supported by Fedora 25.
- Provide updated yocto builds on Igalia's meta-browser fork.

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Mus' External Window Mode - TODO

- Ensure no feature losses when compared to stock Chromium X11/Linux.
- Ensure there is no performance penalties when compared to stock Chromium X11/Linux.
- Start to upstream some of the changes.

Discussion: UI / GPU split

- chrome –-mash (and --mus) still runs the UI and GPU components in the same process but separate threads.
  - Future: musws and musgpu in separate processes
    - https://crbug.com/643746
  - owner: rjkroege@
- Mojo-fication of Ozone/Wayland
  - Use approach similar to Ozone DRM/GBM (ChromeOS)?
  - GBM surface
    - rjkroege: to be discussed later.

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Questions?

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RENESAS

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