Wayland Full-Screen Shell

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About Me

- Ph.D. student in mathematics at Iowa State University
- Involved in Wayland since early 2013
- Working for Intel on the i965 driver since June
X Server

X Client

Window Manager (X Client)

Device Drivers

Input

Output
What about code re-use?

We push the common functionality into external libraries:

- KMS for modesetting
- DRM for buffer graphics buffer management
- OpenGL [ES] for GPU-accelerated compositing
- pixman for CPU-accelerated compositing
- libinput for handling different input devices

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Why not just use X?

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- Any client can get the contents of any window
- Any client can give any other client input

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In Wayland...

- The compositor is at the center and each client has its own namespace
- Clients get input directly from the compositor
- Clients aren’t, in general, aware of other clients’ existence
- A client’s surface contents is kept between the compositor and the client

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- X provided a common *userspace* input/output layer
- "All you have to do" is implement a DDX and everything just runs on it (more-or-less)
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- Not all output devices are hardware
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Case Study 1: VNC/RDP Sessions

How this is done on X:

- Implement either a full X server or a DDX for X.org
- Lives entirely in userspace and doesn’t require root
- Clients and window managers talk to it like any other X server

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This poses some problems for Wayland:

- Current input/output abstractions assume hardware
- DRM and KMS require a kernel driver
- External libraries exist, but require native support in every compositor.

Yes, Weston has an RDP backend, but adding backends for every network protocol to every compositor isn’t a long-term solution.
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Case Study 2: Screen recording/sharing

How this is done on X:

▶ Implemented as a regular client
▶ Any client can grab any other clients contents or the entire front buffer
▶ Any client can send ”input” to any other client

This raises huge security concerns:

▶ Clients can grab sensitive information displayed by other clients
▶ Clients can fake input and control other clients. (What if they are running as root?)
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- Clients are isolated and no regular client can grab the screen
- Screen capturing is done by the compositor
- The result may be processed by the compositor directly or handed to a special trusted client

Weston has support for some of this:

- Screen recording via a trusted weston-screenshooter client
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- Only accessible by trusted clients
- Allow a client to capture the screen and provide input
- Compositors implement one protocol
- Many people can write sharing/recording clients
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- VNC/RDP servers, etc. implement a Wayland compositor
- Compositors launch the subsidiary compositor and connect as a Wayland client
- The compositor is still in control of who gets the screen contents
- The protocol is already written!
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Compositor
(mutter, KWin, etc.)

libinput

VNC/RDP Compositor

Open GL

KMS

DRM

evdev
Enter: `wl_fullscreen_shell`

- `present_surface`:
  Presents a surface a single surface on an output with a possible scaling mode.

- `present_surface_for_mode`:
  Provides similar functionality but gives the client control over modesetting.
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Demo!
Screen recording/sharing is just the beginning!

- Easier to write compositors:
  - Write as a Wayland client and let Weston handle input/output
- Userspace Miracast
- Modesetting when kernel modules aren’t an option

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Questions?