Modern Camera Handling in Chromium

Implementing Camera Access with xdg-desktop-portal and PipeWire in Chromium

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About Me

- Michael Olbrich
- Embedded Linux developer
- Graphics team

- Pengutronix
- Embedded Linux consulting & support
Cameras in Chromium – Current State

- Uses V4L2 directly
- Very little development ("finished")
“Obscure” Unsupported Use-Cases

- Camera selection outside of Chromium
- Screenshare as camera
- H.264 only cameras
- IP cameras
“Real” Unsupported Use-Cases

- Proper camera handling in Containers (Snap / Flatpack)
- Cameras that require libcamera
  - e.g. some Microsoft Surface™ devices with IPU3.
High-level Camera API

Requirements:
- Flexible camera authorization
- High-level camera API that can support different backends

Solution:
- xdg-desktop-portal & PipeWire
xdg-desktop-portal / PipeWire Camera API
xdg-desktop-portal / PipeWire Camera API

start streaming

Chromium

PipeWire
1. Try: PipeWire Camera Backend in Chromium

- Initial implementation ready in January 2021
- Some initial problems finding reviewers
- Problems dynamically loading libpipewire
1. Try: PipeWire Camera Backend in Chromium

“I didn't see the code yet, but I think this belongs into WebRTC, ...”

-- Jan Grulich
2. Try: PipeWire Camera Backend in WebRTC

- Camera API already exists, used by Firefox
- New PipeWire camera backend in WebRTC
- New WebRTC camera backend in Chromium
Camera API Problems

- synchronous API to enumerate camera devices:
  - `static DeviceInfo VideoCaptureFactory::CreateDeviceInfo()`
  - PipeWire and xdg-desktop-portal communication is asynchronous

- stateless API to create a camera object:
  - `static VideoCaptureModule VideoCaptureFactory::Create(string id)`
  - Camera enumeration and creation must share the pipewire session

- frames are copied and converted to I420 in WebRTC
  - Chromium does the same thing for frames coming from the backend
Supporting PipeWire and V4L2 Simultaneously
Where are We Now (WebRTC)?

- Split out generic portal / pipewire code  
  - https://webrtc-review.googlesource.com/c/src/+/281661

- Add callback for raw frames for video capture  
  - https://webrtc-review.googlesource.com/c/src/+/264548

- Add pipewire/portal video capture support  
  - https://webrtc-review.googlesource.com/c/src/+/261620

- Build video capture implementation for chromium  
  - https://webrtc-review.googlesource.com/c/src/+/264553
Where are We Now (Chromium)?

- Video Capture Linux: factor out v4l2 camera support
  - https://chromium-review.googlesource.com/c/chromium/src/+/3634526
- Video Capture Linux: add backend for portal / pipewire cameras
  - https://chromium-review.googlesource.com/c/chromium/src/+/3308882
What’s Next?

- Support new xdg-desktop-portal device API
  - [https://github.com/flatpak/xdg-desktop-portal/pull/659](https://github.com/flatpak/xdg-desktop-portal/pull/659)
- Image rotation
- Pan, tilt, zoom, focus, ...
Thanks

- Jan Grulich, Mark Foltz
- Ilya Nikolaevskiy, Alex Cooper
- Kieran Bingham
- ...

WOLFWISION
By the way...

... we are hiring

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Thank You!

Questions?