



## **UHAPI and DirectFB**

**CE Linux Forum Technical Jamboree,  
13/14th June, Yokohama, Japan**

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**Denis Oliver Kropp (DirectFB)**

**June 14<sup>th</sup>, 2005 Yokohama, Japan**

# Outline

- **Introduction**
- **DirectFB Core features**
- **UHAPI Vmix Core features**
- **Commonalities between DirectFB and UHAPI**
- **Functional overlap / differences**
- **How can they go together?**
- **Conclusion**

# Introduction

- **Conclusion from the last CELF face-2-face Audio Video Gfx workgroup meeting:**
  - DirectFB is interesting, and a recommend part of CELF specification
  - UHAPI is interesting, and proposed as part of the CELF specification
- **Question: How can they go together in the CELF specification?**
  - Both specs have been studied, by the UHAPI forum and the DirectFB author Denis Oliver Kropp
  - This presentation reports the results of the study and meetings that took place



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## DirectFB core features

- Powerful graphics library for Linux
- Designed with embedded systems in mind
- Compliant to Multimedia Home Platform (MHP)
- Provides HW abstraction
- Allows HW acceleration where possible
- Recommended by the CELF 1.0 specification, adopted by many members



## DirectFB core features

- Drawing (lines, rectangles, filling etc.)
- Blitting (scaled blended, color keyed etc).
- Font rendering
- Window management.
- Multiple application support
  - resource management
- Handling input events.
- Scaling.
- Color keying.
- Layer mixing.

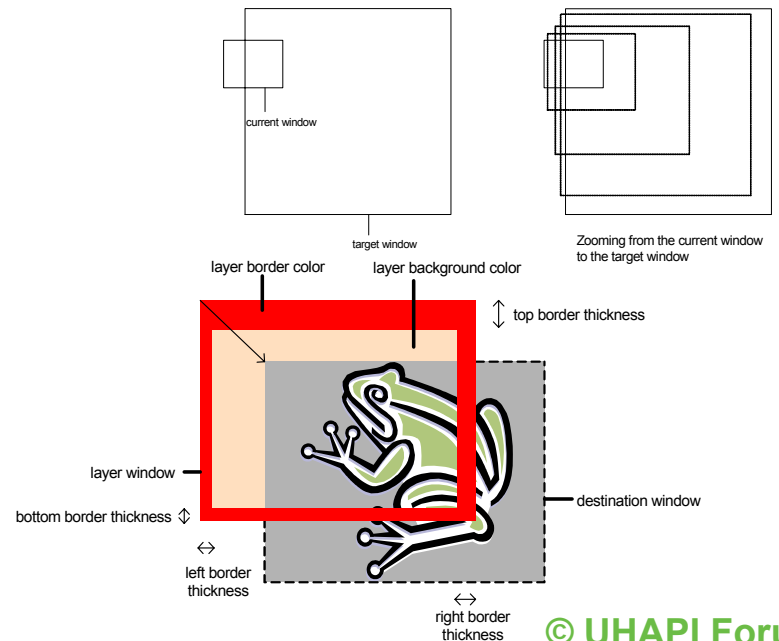
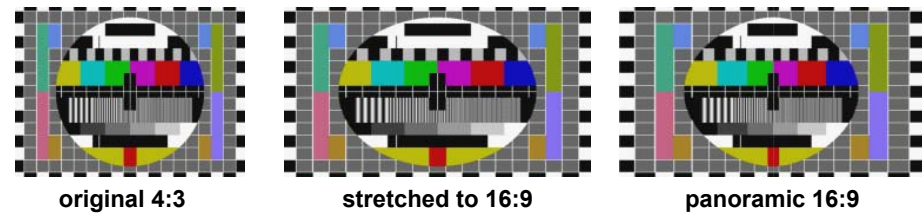


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## UHAPI Vmix LC core features

- No Gfx, just a SetBuffer
- Cropping / positioning of live video
- Scaling (e.g. Non-linear)
- Auto-blanking
- Blanking / hiding
- Smooth zooming / fading
- Strobing / freezing
- Color keying
- Layer borders
- Layer mixing / blending





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## UHAPI and DirectFB (similarities)

- **Both are at about the same level of abstraction**
- **Both try to abstract different platforms, and provide room for differentiation**
- **DirectFB is implemented in user space**
  - UHAPI can also be implemented in user space
  - UHAPI4Linux is implemented in user space (using available PC Tuner card support)
- **Both use interface-based programming**
- **Both use a “functional interface” (strong typing)**
  - For example, no ioctl with weakly typed struct as parameter
  - Helps to catch programming errors early
- **Both use vtables and AddRef/Release**
- **QueryInterface can be added easily to DirectFB (for free)**
  - Denis is looking into using the UHAPI interface technology support

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## UHAPI and DirectFB (functional overlap)

- **UHAPI focus: AV streaming control**
- **DirectFB focus: Graphics**
- **UHAPI and DirectFB are complementary except where AV streaming “meets” graphics:**
  - Both UHAPI and DirectFB support layer mixing and color keying
  - Both have concepts for controlling an encoder
- **Considering all of UHAPI and DirectFB, the overlap is really small**

## UHAPI and DirectFB (differences)

- **Provided by UHAPI video mixer, not by DirectFB:**
  - Non-linear scaling, smooth zooming, fade to, auto-blanking, layer borders, strobing, freeze
- **Provided by DirectFB, not by UHAPI:**
  - Blitting / drawing / fonts, window management, clip board, input devices

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# How can they go together?

- DirectFB responsible for graphics layers
- UHAPI responsible for video layers written to by the UHAPI platform, and exclusive set of gfx layers (e.g. subtitles)
- Remaining set of gfx layers used by DirectFB implementation
- DirectFB used for all gfx related functions
- Don't support certain DirectFB options like:
  - IDirectFBScreen (encoder)
  - Field synchronised gfx
  - Colour adjustment
  - ...
- Denis is looking into defining profiles for DirectFB
  - E.g. a UHAPI profile could imply: don't use IDirectFBScreen
- → Backwards compatible for both DirectFB and UHAPI applications

# How can they go together (details)?

## ■ Don't support VideoProviders

- Much more detailed control is required and provided by UHAPI
- Little used, not core of DirectFB

## ■ Don't support IDirectFBScreen

- Proposed solutions are not powerful enough
  - ◆ E.g connecting to output connectors, encoder control
- Typically only used by HW dependent applications
- Little used interface (only recently defined)

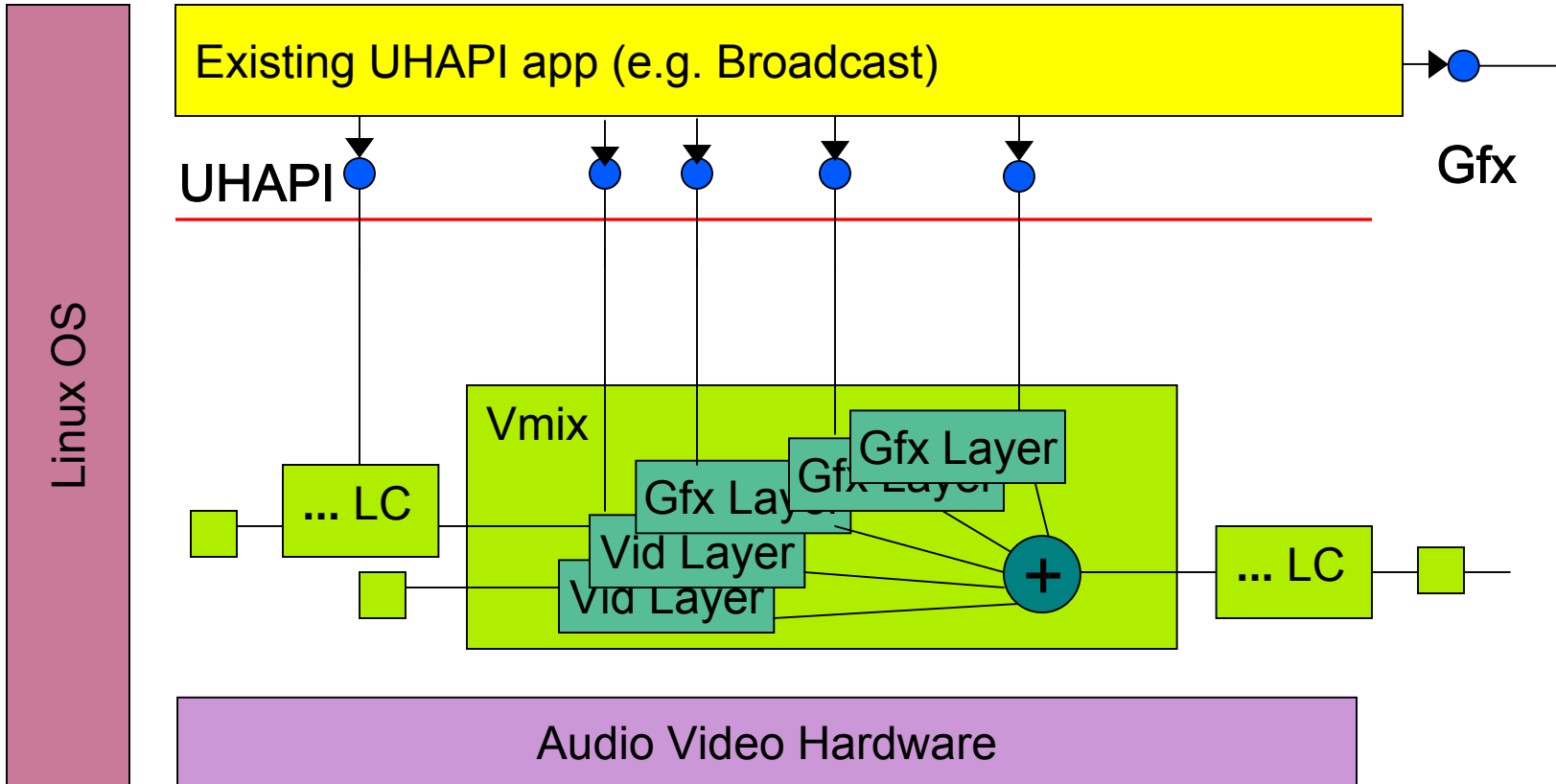
## ■ IDisplayLayer

- Only provide one source, just setting a source is not powerful enough (use case concept of UHAPI)

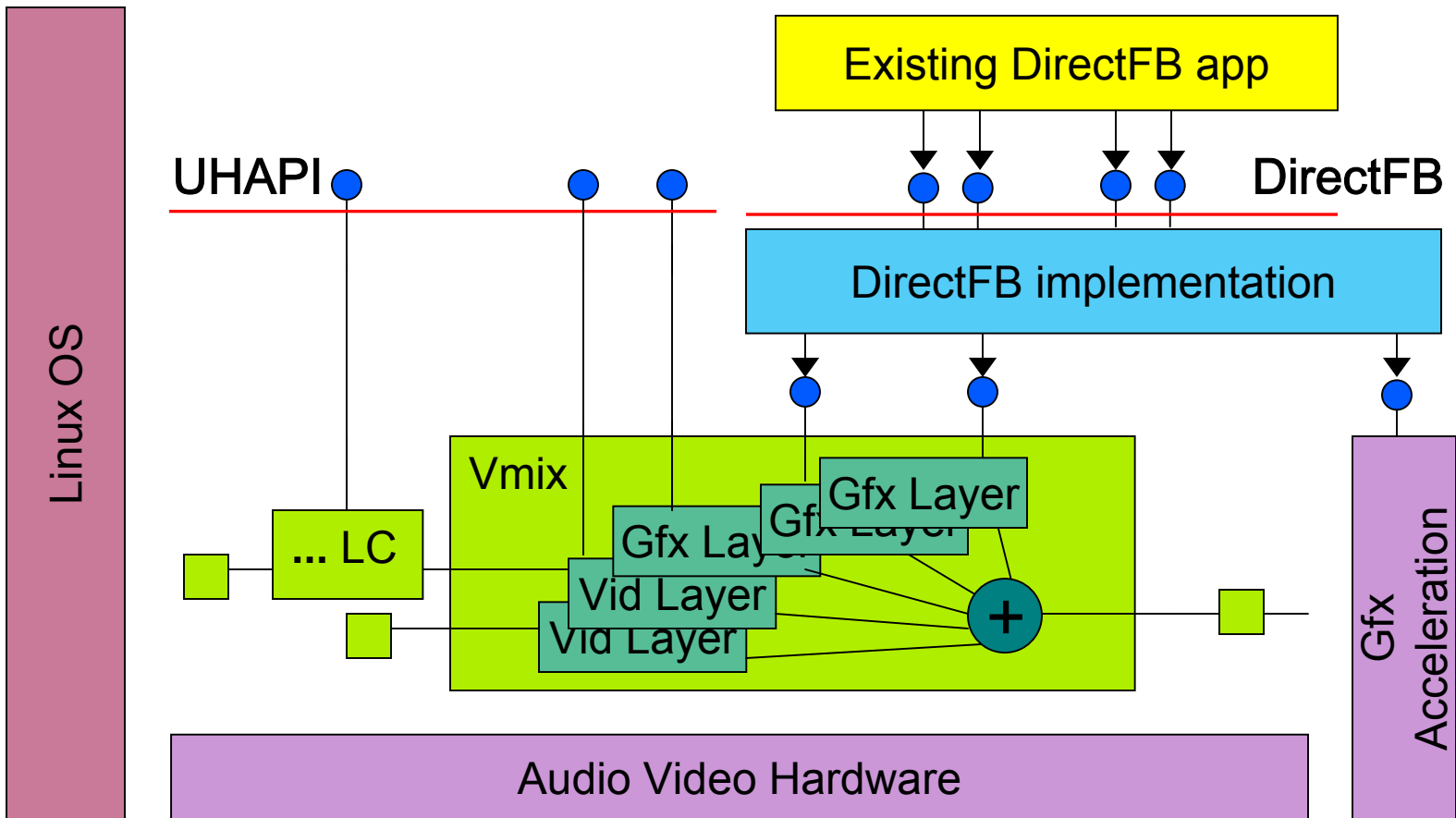


# DirectFB – UHAPI mapping (1)

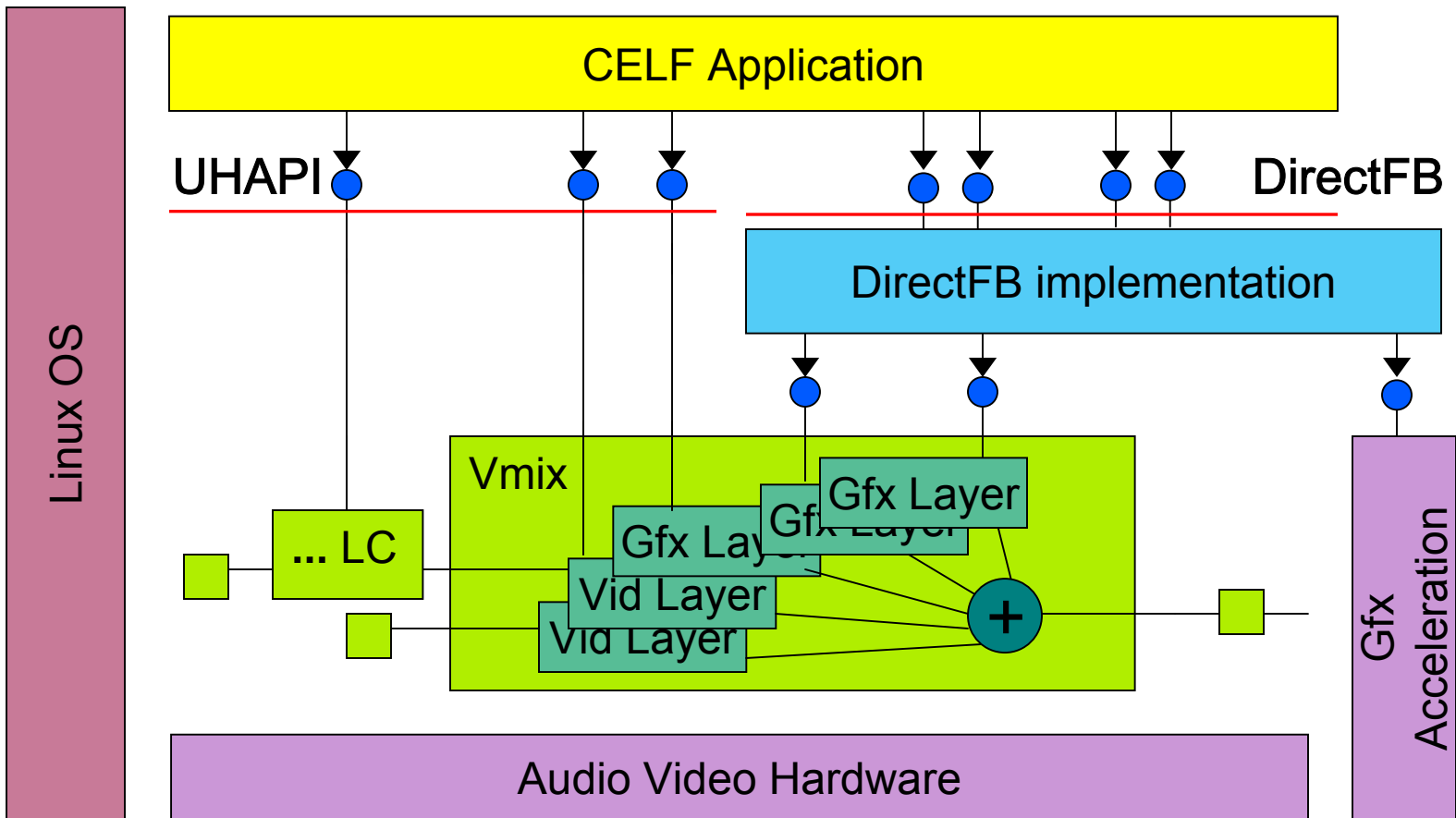
Vmix is one out of 50 existing UHAPI components!



# DirectFB – UHAPI mapping (2)



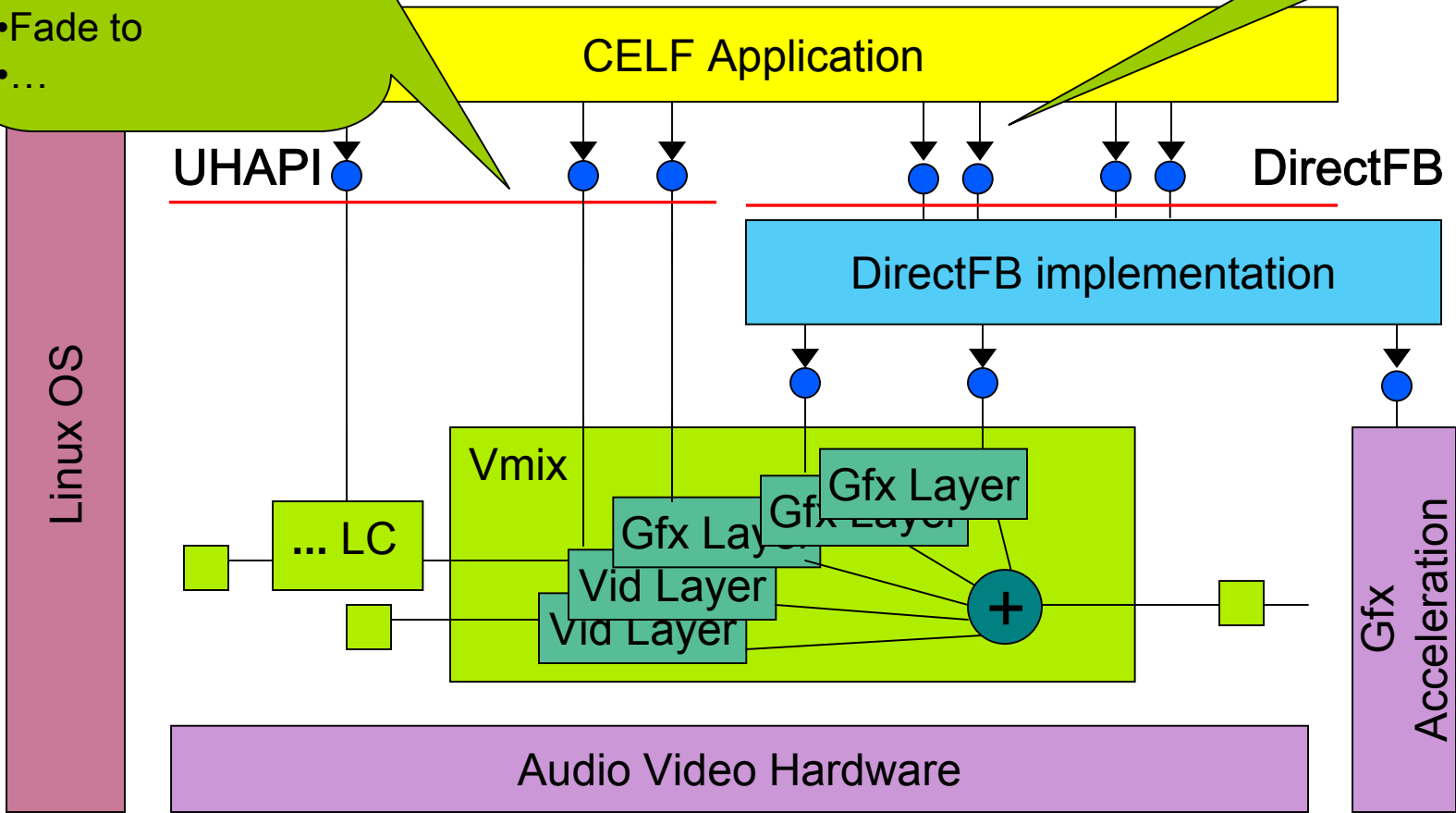
# DirectFB – UHAPI mapping (2)



## DirectFB – UHAPI mapping (2)

- Non-linear scaling
- Render Subtitles
- Color key ranges
- Borders
- Fade to
- ...

- Accelerated gfx
- Windowing
- Input devices
- Fonts
- ...



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# Conclusion

- **DirectFB focusses on Gfx functionality**
  - This was left out of UHAPI to keep it OS agnostic
  - In the CELF context this is a good embedded Linux solution
- **UHAPI focusses on Audio Video control**
- **DirectFB and UHAPI use very similar technology and look and feel**
- **They go together very well**
- **DirectFB Gfx applications can be reused**
- **UHAPI applications can be reused**
- **Denis Oliver Kropp and UHAPI are actively making DirectFB and UHAPI fully compatible**