UHAPI and DirectFB

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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
- ...

CELF Application

Gfx Layer

Gfx Layer

Vmix

Vid Layer

Vid Layer

UHAPI

DirectFB

Linux OS

Audio Video Hardware

• Accelerated gfx
• Windowing
• Input devices
• Fonts
• ...

DirectFB implementation
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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**