

net2o: Application Layer

Browser Components

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Overview

Motivation

Sidetracking: What Changed Due to Snowden?

Requirements

A Few Demos

Slideshow

Videos

Text

Outlook

Purpose?

People want to share information (*share means copy*)

- Texts, photos, videos, music
- longer, structured documents
- Real-time media (chat, videos, video conferences)
- collaborative gaming

Things I want to show

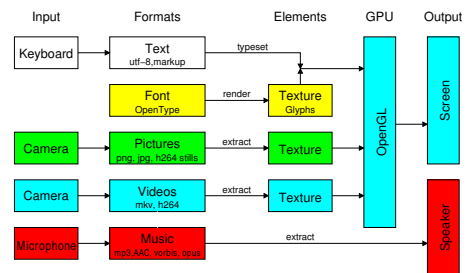
- In 2011 I did a presentation with the same title — back then, this was complete vaporware: the plan.
- Now there are components which need to be put together
- and there's a concept how to do that
- needs to work on PCs and mobile platforms like Android, which are sometimes "a bit strange".

Sidetracking: Impact of Snowden Leaks

- Encryption now uses Keccak (SHA-3) as primitive. Universal crypto primitive, faster than Wurstkessel at same level of security, chosen in an open competition.
- ECDHE for connection setup in a way that doesn't reveal identities (metadata!)
- Made sure the random numbers use entropy of the system, but not directly system random numbers
- Secure internet more important than ever!

Formats and IO

How to display things



Why OpenGL?

OpenGL can do everything

OpenGL renders:

- 1 Triangles, lines, points — simple components
- 2 Textures and gradients
- 3 and uses shader programs — the most powerful thing in OpenGL from 2.0.

Real requirement: visualization of *any* data. OpenGL can do that.

How to connect the media?

Lemma: every glue logic will become Turing complete

- currently used glue: HTML+CSS+JavaScript
- containers with Flash, Java, ActiveX, PDF, Google's NaCl...
- conclusion: use a powerful tool right from start!
- browser: run-time and development tool for applications

Security

Lemma: every sufficiently complex format can be exploited

Java's approach to secure the language from the inside can be seen as a failure. Java is now malware entry door number 1.

Sandbox

- sandbox the process that interprets network apps
- funnel network connections through a proxy — a shared memory module for net2o is missing
- encryption (key access!) outside the sandbox
- „same-origin“-policies don't work in a P2P cloud

Slideshow

I use the slide-how for this presentation

Fader

```
: fade { n1 n2 f: delta-time -- } n1 n2 = ?EXIT
ftime { f: startt }
BEGIN ftime startt f- delta-time f/ fdup 1e f< WHILE
<draw-slide
1e blend n1 draw-slide
( time ) blend n2 draw-slide
draw-slide> REPEAT
<draw-slide 1e blend n2 draw-slide draw-slide>
fdrop ;
```

Slideshow 2

Even more effects

Hslide

```
: hslide { n1 n2 f: delta-time -- } n1 n2 = ?EXIT
ftime { f: startt }
BEGIN ftime startt f- delta-time f/ fdup 1e f< WHILE
<draw-slide
pi f* fcos 1e f-
[ pi f2/ fnegate ] FLiteral f* fcos 1e f-
fdup n1 n2 > IF fnegate THEN xshift n1 draw-slide
2e f+ n1 n2 > IF fnegate THEN xshift n2 draw-slide
draw-slide> REPEAT
<draw-slide n2 draw-slide draw-slide>
fdrop ;
```



Approach and Problems

libSOIL: Simple API to load images

libjpeg and libpng have a very complicated AP
Other option: libSOIL:

libSOIL load texture

```
: >texture ( addr w h -- )
2 pick >r rgba-texture wrap nearest r> free throw ;
: mem>texture ( addr u -- addr w h )
over >r 0 0 0 { w^ w w^ h w^ ch# }
w h ch# SOIL_LOAD_RGBA SOIL_load_image_from_memory
r> free throw w @ h @ 2dup 2>r >texture 2r> ;
: load-texture ( addr u -- w h )
open-fpath-file throw 2drop slurp-fid mem>texture ;
```



Onion-Programming

Looks big from the outside



Onion-Programming

Use of martial tools recommended



Onion-Programming

Onion "all the way down"



Videos

OpenMAX AL

- Android uses OpenMAX AL as video framework — similar to gstreamer, but slightly different...
- renders video into a texture, but can also record videos from the camera
- input: MPEG transport stream
- C++-like C API (vtable implemented as function pointer struct)
- only half-hearted implemented, needs Java via JNI, can't handle resizes
- four languages for video player: Forth, C, Java, OpenGL shader language



JNI declarations

MediaPlayer

```
jni-class: android/media/MediaPlayer

jni-new: new-MediaPlayer ()V
jni-method: prepare prepare ()V
jni-method: start start ()V
jni-method: setSurface setSurface (Landroid/view/Surface;)V
jni-method: setVolume setVolume (FF)V
```



JNI declarations II

SurfaceTexture

```
jni-class: android/graphics/SurfaceTexture

jni-new: new-SurfaceTexture (I)V
jni-method: updateTexImage updateTexImage ()V
jni-method: getTimestamp getTimestamp ()J
jni-method: setDefaultBufferSize setDefaultBufferSize (II)V
jni-method: getTransformMatrix getTransformMatrix ([F)V
```



JNI calls

get timestamp

```
: get-deltat ( -- f )
media-sft >o getTimestamp o> d>f 1e-9 f*
first-timestamp f@ f- ;
```

Java-Calls integrate seamless into Mini-OOF2 (Mini-OOF with current object)



MTS? All videos today are MKV!

"Matroska" sounds like onion programming, too...

Container — what for?

- Usual explanation: several files too difficult to handle. IMHO, directories with multiple files are better than containers.
- Videos and audio stored as single frames and short packets
- Timestamps for synchronized playback
- Index for random access



Matroska interpreter

Binary XML format



Solution: read MKV, convert to MTS

- Matroska parser uses a hash table for the tags
- each tag has an associated Mini OOF2 method
- different classes for different purposes: dump for inspection, MTS converter class

Fonts rendering

FreeType–GL renders OpenType fonts into OpenGL–Textures



- OpenType is state of the art
- we render textures, so the vector font needs to go into a texture
- FreeType–GL uses a texture as glyph cache
- 1 glyph: 2 triangles

Text Render Demo Code



Fonts and Texts

```
48e FConstant fontsize#
atlas "/system/fonts/DroidSans.ttf\0" drop
fontsize# texture_font_new Value font1
atlas "/system/fonts/DroidSansFallback.ttf\0" drop
fontsize# texture_font_new Value font2
Variable text1$ "Dös isch a Tägscht." text1$ $!
Variable text2$ "这是一个文本：我爱彭秀清。" text2$ $!
```

Text Render Demo Code II



Fonts und Texte

```
: glyph-demo ( -- ) hidekb
1 level# +! BEGIN
<render
0. penxy 2!
font1 to font text1$ $@ render-string
-100e penxy sf! -60e penxy sfloat+ sf!
font2 to font text2$ $@ render-string
render>
sync >looper
level# @ 0= UNTIL ;
```

Outlook

This presentation has been rendered with L^AT_EX Beamer...



- The next presentation should be rendered with MINOS2
- Texts, videos, and images should be get with net2o, shouldn't be on the device
- Typesetting engine with boxes and glues, line breaking and hyphenation missing
- a lot less classes than MINOS — but more objects
- add a zbox for vertical layering
- integrate animations
- combine the GLSL programs into one program?

Literature&Links



 BERND PAYSAN

<http://fossil.net2o.de/net2o/>

 BERND PAYSAN

<http://fossil.net2o.de/minos2/>