Mesa at 20 years (or so)

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OpenGL Beginnings

- The OpenGL API was officially announced in July of 1992 (spec, conformance tests, etc).

- Man pages and some sample code was available earlier in the year.

- I first read about OpenGL on the comp.graphics Usenet newsgroup (pre-WWW).

- I had been using SGI's IRIS GL for a year or so.

- I read the docs and immediately saw that OpenGL was a big step forward from IRIS GL.

But first, some personal prehistory

- I discovered computers as a freshman in high school. TRS-80 Model III. 16KB RAM, tape drive. 128X48 "pixel" monochrome graphics mode.

- Paint program

My first home computer

- Atari 800XL – 64KB RAM, 320x192 in monochrome, 160x192 with four colors, cassette storage.

- By the time I was done I'd written a 3D modeler, 3D renderer (painter's algorithm), and a ray tracer.

My College Machine

- Amiga 500 – 1MB RAM, 640x400, 4096 colors, floppy drive, window system

- Wrote lots of 3D projects (in Modula-2).

- Scan-line rasterizer with lighting and dithering.
  One-line Z buffer.

- Ray tracers

My 3D renderer had an API...

```
LightPos(x, y, z);
LightColor(r, g, b);
LookAt(ex, ey, ez, tx, ty, tz);
Color(r, g, b);
BeginPolygon();
Vertex(x, y, z);
Vertex(x, y, z);
Vertex(x, y, z);
EndPolygon();
…
```

Look familiar?

Workstation Graphics

- In the early 1990s 3D workstations were extremely expensive. Very few had access to realtime 3D graphics.

- Lots of competing vendors, different hardware, different 3D APIs.

- But SGI and IRIS GL was pretty much dominant. Luckily, that's what I got involved in.

- Lots of 2D workstations around (no 3D hw).

Vis5D

- A 3D visualization program on SGIs that I helped develop at the U. of Wisconsin.

- We needed a graphics solution to run Vis5D on other 2D Unix workstations.

- Found the "VOGL" library which was a very small subset of IRIS GL.

- I hacked in triangle rendering and other bits.

- It worked, but it was ugly.

OpenGL Arrives

- One 3D API to rule them all – SGI hoped.

- 1992: specs, man pages, sample code, etc.

- I read the OpenGL docs and wanted to use it ASAP because it was so much nicer then OpenGL.

- It would be quite a while before vendors actually had OpenGL implementations...

Mesa origins

- After having worked on VOGL and then seeing OpenGL I quickly decided to write my own renderer using the OpenGL instead of IRIS GL.

- Started from scratch sometime in 1992/93.

- First started coding on my Amiga at home but quickly moved to Unix systems at work. I used floppy disks to move the code back and forth.

- Developed the device driver interface to accommodate Amiga vs. Xlib drawing.

Mesa First Steps

- Matrix, viewport functions and vertex transformation.

- Drawing points, lines, filled triangles with clipping.

- Z-buffer, simple lighting (enough for Vis5D)

- It was a bit hard not having another OpenGL implementation to compare to. I used SGI sample programs and corresponding 'redbook' images as a reference.

- Kept working on Mesa in the evenings and weekends through 1994. I had a lot more spare time back then!

November 1994

- By this point I had implemented all of OpenGL 1.0 except mipmapping, antialiasing and some parts of GLU (NURBS).

- I thought I had something useful to share.

- First, I thought I better ask SGI for permission.

- SGI, a bit surprisingly, was receptive to an open-source version of OpenGL. I don't think they saw it as a threat but as a way to promote their new API. Real OpenGLs were still very scarce at that point.

- The main condition was don't call it "GL". And attach a boilerplate disclaimer saying "Mesa is not a real OpenGL" (little did they know the future).

- The name Mesa just sort of popped into my head one day.

Open Source Launch (Feb 3, 1995)

- Announced Mesa 1.0 beta on comp.graphics mailing list.

- No expectations for success or longevity.

- Within a couple days I was receiving email ("wow", "thanks", patches, etc). Far more than I ever expected.

- I quickly created a Mesa page on the newfangled World Wide Web and setup a public mailing list.

- Luckily, I was able to work on Mesa part-time at my day job (thanks to Bill Hibbard).

Big issues in the early days

- Cross-platform coding: SGI/IRIX, Sun, HP, DEC, IBM/AIX and other obscure systems. Mostly compiler issues.

- Dealing with 8-bit displays, X colormaps and dithering (even for 1-bit mono displays!).

- Incorporating a flood of patches and rolling out new releases (with no revision control!)

- Performance

- But, I knew <u>every</u> line of code and the API was still pretty small, so it was fun, straight-forward work.

Mid 1990s

- Mesa 2.0 (Oct 1996): OpenGL 1.1 support. Texture objects! Vertex arrays! LogicOps!

- Mesa 2.2 (March 1997): First hardware support- 3dfx Voodoo 1 via the Glide library.

- Mesa 3.0 (Sep 1998): First available implementation of OpenGL 1.2 (3D textures, separate specular color, ARB imaging, etc).

- I buy a PC and install that Linux OS (Slackware floppies) that seems to be getting popular (and XFree86).

- OpenGL was gaining momentum...

Late 1990s

- 3D takes off

- Consumer 3D hardware is arriving (NVIDIA, ATI, Matrox, 3dfx, Intel, 3dLabs).

- Direct3D or Glide, very limited OpenGL support, if any.

- SGI open-sources the GLX client/server code.

- Utah GLX project (XFree86 server-side 3D drivers, indirect rendering).

- Keith Whitwell gets involved. John Carmack funds his development efforts.

- Precision Insight is formed and the DRI is developed.

- I join P.I. in Sep 1999 to work on Mesa/DRI/GLX full time. By this point I'm no longer the majority developer.

2000s

- DRI becomes well-established.

- Tungsten Graphics founded in fall of 2001.

- Mesa 4.x, 5.x, 6.x, 7.x with lots of hardware drivers.

- Gallium projects starts in 2008.

- Programmable shading and and tons of OpenGL extensions are developed.

Today

Things I never expected:

- Many active developers, several hundred contributors

- Commercial funding

- Approx. 1,000,000 LOC

- Integral to almost every Linux distro

- Used by thousands (or millions?) of people

- A very successful project by my measure

Some keys to success

- Mesa was the right project at the right time. I just happened to be the person that got things going first.

- I like Fred Brooks computer scientist as a "tool maker" perspective.

- Let people smarter than me take control of the areas they're interested in.

- Keep the development community around Mesa relatively friendly and open (no insults, screaming, etc.)

- Thank god we're following a spec!

Thanks

- At this point, the contributions of other developers greatly outweighs the work that I've done.

- The Mesa project has grown far beyond my expectations.

- I've been super impressed by the amazing work that other people have done.

- I've gotten to know and work with some great people and made a lot of friendships through the project.

Questions?

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