OpenGL ES BOF

Tom Olson
Chair, OpenGL ES Working Group
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Outline

Introduction - Tom Olson

OpenGL ES 3.0 API Overview - Benj Lipchak

GLSL ES 3.0 Shading Language - Bill Licea-Kane

Wrap-up and Other News - Tom

Member Presentations
Looking Back

• **SIGGRAPH 2002**
  - OpenGL ES Working Group formed

• **SIGGRAPH 2003**
  - OpenGL ES 1.0 specification released

• **SIGGRAPH 2004**
  - OpenGL ES 1.1 specification released

• **GDC 2007**
  - OpenGL ES 2.0 specification released
Looking Back... continued

- 2007/8 OpenGL ES 1.x platforms
- 2009/10 OpenGL ES 2.0 platforms
- 2011: High-end 3D content comes to mobile

**SIGGRAPH 2012: OpenGL ES 3.0!**
OpenGL ES 3.0 Goals

• Provide the functionality needed by modern applications
  - Feature set based on OpenGL 3.3 / 4.x
  - Reduces need for extensions

• Make life better for the programmer
  - Tighter requirements for supported features
  - Reduce implementation variability

• Don’t damage OpenGL ES 2.0 ecosystem momentum
  - Backward compatible with OpenGL ES 2.0
OpenGL ES 3.0 API Overview

Benj Lipchak
OpenGL ES 3.0 API Specification Editor
The OpenGL ES® Shading Language
Language Version: 3.00

Bill Licea-Kane
AMD
SIGGRAPH 2012, Los Angeles
Shader Centric (OpenGL ES Centric) view

- Functional superset of Language Version 2.00
- **Shader processors**
  - Vertex and Fragment Shaders
  - Floating Point (IEEE 32 bit)
  - Integer (32 bit signed and unsigned)

- **Uniform Buffer Objects**
  - 12 Vertex + 12 Fragment binding points, 16KB

- **Transform Feedback Buffers**

- **Multiple Draw Buffers**

- **Texture Samplers**
  - sampler3D, sampler2DArray, sampler2DShadow, samplerCubeShadow
  - integer and unsigned integer samplers

- **Appendix A: Limitations is GONE**
Shader Centric (OpenGL Centric) view

- Subset of OpenGL 3.3
  - No geometry shaders
- Some “cherry picks” from OpenGL 4.x
- OpenGL ES 2.0 features
  - Example – precision qualifiers
"porting"

```glsl
#version 100 // implicit
precision mediump float;

varying vec4 color;

void main()
{
    gl_FragColor = color;
}
```

```glsl
#version 300 es // required
precision mediump float;

in vec4 color;

layout(location = 0) out vec4 data;

void main()
{
    data = color;
}
```
Half a day conservation effort

```plaintext
#version 300 es
precision highp float;
sampler2D floatMap; // lowp
sampler3D cubeMap; // error

#version 300 es
precision highp float;
precision highp sampler2D floatMap;
precision lowp sampler3D cubeMap;
```
Thank you
Wrapping it up
(and other news)

Tom Olson, ARM
Chair, OpenGL ES Working Group
Putting it all together

Content: ARM “Timbuktu 2” tech demo

- HDR using RGB10_A2 render-to-texture and tone mapping
- Self-shadowing using depth textures with shadow sampling
- Multi-layered track texture using 2D texture arrays
- ETC2 / EAC texture compression used throughout
**Kishonti GLBenchmark 3.0**

- **Deferred rendering using multiple render targets (MRT) and depth textures**
- **Occlusion query used to determine light visibility**
- **Instanced drawing used for vehicles and particles**

Kishonti “GLBenchmark 3.0” preliminary
And in other news...

- **Introducing the KHR extension tag**
  - For extensions designed and approved by both OpenGL and OpenGL ES WGs
  - Ratified by Khronos Promoters

- **KHR_debug**
  - Combined functionality of four ARB debug extensions
  - Issues reported via callback functions or logs
  - Labels and markers to relate messages to objects / events

- **KHR_compressed_texture_astc_ldr**
  - Adaptive Scalable Texture Compression (ASTC) LDR modes
  - 1 to 4 color components: R / RG / RGB / RGBA
  - Orthogonal choice of bit rate, from 8 bpp to <1 bpp in fine steps
  - Quality exceeding S3TC or PVRTC at same bit rate
Member Statements

Member, OpenGL ES Working Group
ARM commitment to Khronos standards

- **OpenGL® ES 3.0 Commitment**
  - ARM® Mali™ Midgard family designed from the start to support OpenGL ES 3.0*
  - OpenGL ES 3.0 desktop emulator and compression tools available at http://www.malideveloper.com

- **ASTC™ Commitment**
  - Invested in ASTC concept and led development of the technique
  - New ARM Mali-T624/T628 and Mali-T678 add ASTC texture compression support* across the family of products (KHR_compressed_texture_astc_1dr)

* Product is based on a published Khronos Specification, and is expected to pass the Khronos Conformance Testing Process.
DMP SMAPH-S Now Supports OpenGL ES 3.0

DMP is the leading graphics IP core provider for computer vision, image processing, and mobile gaming applications

- Nintendo3DS and NintendoDS XL
- 5 out of TOP7 Global Camera OEMs are licensing DMP Graphics IP for:
  - High quality 3D graphics rendering
  - Fast 2D-vector graphics rendering for UIs
  - Camera image texture streaming
  - Camera image processing

- DMP SMAPH-S and PICA200 Graphics IP Family is used for these devices and use cases
  - OpenGL ES 1.1, ES 2.0 and NOW ES 3.0
  - ES 3.0 enables NG visually intensive apps in mobile gaming and imaging apps
  - SMAPH-S provides clear PPA-leadership (Power-Performance-Area)
• World’s leading supplier of OpenGL ES GPUs – PowerVR
• Full support for OpenGL ES 3.0 for all PowerVR Series6 GPUs
• Full support for ASTC in future PowerVR GPUs
• Extensive set of tools available for free download
  • the PowerVR Insider SDK @ www.powervrinsider.com
• Industry’s largest mobile graphics ecosystem:
  • More than 32,000 members
Intel HD Graphics on Linux

All Intel HD 2000, HD 2500, HD 3000, HD 4000 and later GPUs will be supported

– Fully open source!
– Pre-alpha driver available now
  • Some features not yet implemented

http://cgit.freedesktop.org/mesa/mesa/log/?h=gles3
– Beta driver planned for Q1 2013
The OpenGL® ES 3.0 Benchmark

- Two tests with PC-level visuals – Rush and Racer
- Materials have 4 textures with per pixel lighting,
- Photorealistic test scenarios with 100K+ triangles in scenes

General OpenGL ES 3.0 Features:
- Multiple simultaneous render targets & Antialiasing,
- Instanced Rendering,
- Occlusion Queries

Post-processing:
- Light Bloom, Depth of Field, Tone Mapping with Dynamic Exposure Control

General Graphics Features:
- Character Animation w/skinning & bones,
- Dynamic Shadows and reflections w/PCF filtering,
- Particle effects with Physics from Transform Feedback
Thanks!

Questions?