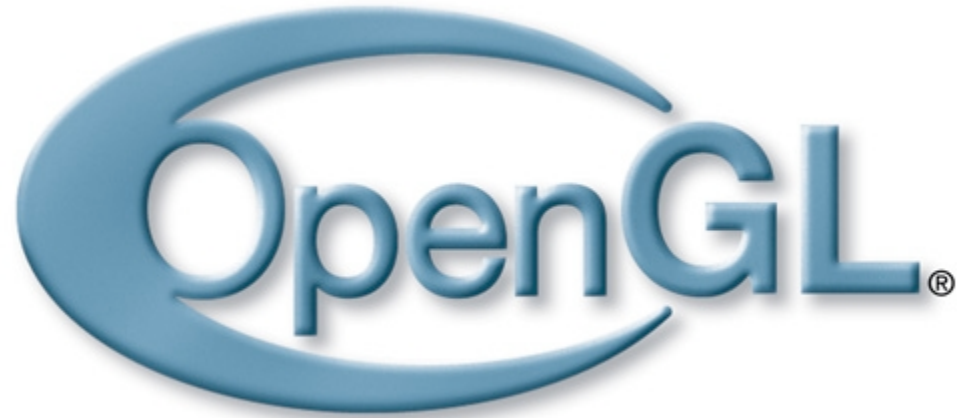




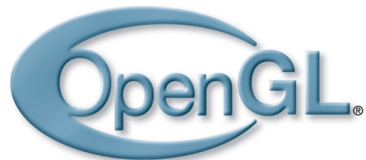
Superbuffers Workgroup Update

Barthold Lichtenbelt



EXT_framebuffer_object update

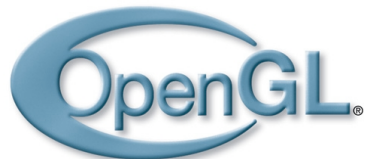
- **Specification stable since September 2005**
- **Version #118 posted to Registry April 2006**
 - Lay groundwork for R, RG rendering
 - Map of window coordinates to pixels and texels in a renderbuffer or texture (can render to border) explained
 - Selecting same attachment multiple times setting DRAW_BUFFERS state writes undefined values
- **Working on ARB_framebuffer_object spec, based on new object model**
 - Will also incorporate new functionality



New functionality

- **Support for R, and RG rendering**
 - L, LA rendering desirable, but deferred
 - Support for half float and float
 - Support fixed 8 bit / component and greater
- **Support attachments of mixed-dimensions**
 - Render to intersection, anchored to lower-left
- **Support color attachments with mixed internal formats**
- **Layered extension, EXT_Framebuffer_object2, to enable the above new functionality**
 - Backup: Could release layered extension if ARB_framebuffer_object is late
 - Might drop mixed-format support if HW cannot do it
 - But not published yet

When do you need this functionality?



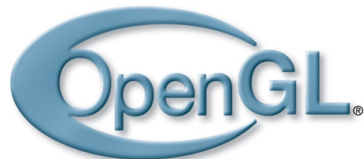
EXT_framebuffer_blit

- Revision 13, June 2006
- Split framebuffer object binding point in separate READ_FRAMEBUFFER and DRAW_FRAMEBUFFER bindings
 - Setting legacy FRAMEBUFFER target sets both READ and DRAW targets
- Allows copy from one framebuffer object to another
- Adds a fast scaling blit command: **BlitFramebufferEXT (...)**
 - Blits one, or more, attachments in one call (color, depth, stencil)
 - Can broadcast color buffer if multiple draw buffers are enabled
 - LINEAR or NEAREST scaling
 - LINEAR scaling only on color buffers
 - No overlapping blits if source and destination are the same
 - Fragment pipeline bypassed. Only pixel ownership and scissor apply
 - Will do format conversion between color buffers only (as in CopyPixels)



EXT_framebuffer_multisample

- Revision 6, June 2006
- Extends FBO to enable multisample rendering
 - Max number of samples queriable with MAX_SAMPLES_EXT
- New entrypoint: **RenderbufferStorageMultisampleEXT (...)**
 - Pass a minimum number of required samples
 - Cannot create multisample textures
- Call **BlitFramebufferEXT (...)** to resolve from multisample buffer to single-sample buffer
 - Can also upsample from single-sample to multisample by replicating
 - Or can blit between buffers with the same number of samples
 - If either read or draw framebuffer are multisampled, no scaling
- No ReadPixels, CopyPixels, CopyTexImage from a multisample renderbuffer
- All images attached to a FBO need to have same number of samples



Implementations

- **Apple**

- Has been shipping EXT_framebuffer_object support since October 2005 and supports it on ATI, NVIDIA, and Intel GPUs.
- Apple has not yet released support for EXT_packed_depth_stencil, EXT_framebuffer_blit or EXT_framebuffer_multisample, but work on these is in progress.

- **Mesa**

- EXT_framebuffer_object and EXT_framebuffer_blit are in Mesa, the former in the Intel i915 hardware driver, other drivers to follow.
- EXT_packed_depth_stencil is supported in Mesa, but I don't believe any of the DRI hardware drivers support it yet.

- **ATI**

- Supports EXT_framebuffer_object.

- **NVIDIA**

- Shipping EXT_framebuffer_object since release 75 drivers and EXT_packed_depth_stencil support since release 80 drivers. Summer 2005.
- Support for EXT_framebuffer_multisample and EXT_framebuffer_blit will be available in future driver releases.

