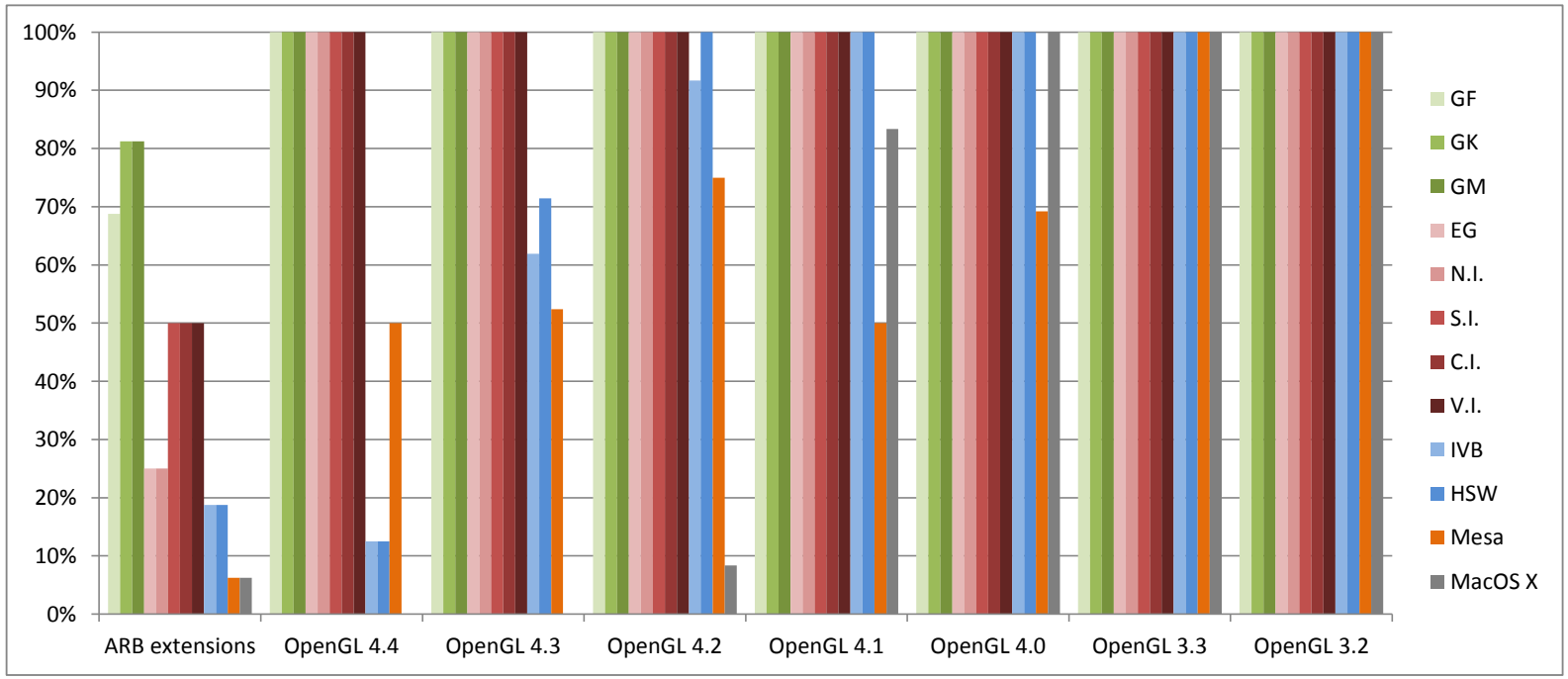
# OpenGL hardware matrix

Extensions exposed by OpenGL implementations

**May 2014, G-Truc Creation**

GF / Fermi: GeForce 400 series, GeForce 500 series
GK / Kepler: GeForce 600 series, GeForce 700 series
GM / Maxwell: GeForce 750
EG / Evergreen: Radeon HD 5000 series, Radeon HD 6000 series
N.I. / Northern Islands: Radeon HD 6900 series
S.I. / Southern Islands: Radeon HD 7000 series, Radeon R7 250X, Radeon R7 265, Radeon R9 280
C.I. / Sea Islands: Radeon HD 7790, Radeon R7 240, Radeon R7 250, Radeon R7 260, Radeon R9 270
V.I. / Volcanic Islands: Radeon R9 290
IVB / Ivy Bridge: HD4000, HD2500
HSW / Haswell: Iris 5000 series, HD 4X00 series

| Vendor | NVIDIA | | | | | | | | Intel | Mesa | Apple |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Drivers version | | | | | | | | | 3412 | git-10.1 | 10.9 |
| Release date | | | | | | | | | 29/01/2014 | 20/02/2013 | 01/10/2013 |
| Platforms | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
| ARB extensions | 69% | 81% | 81% | 25% | 25% | 50% | 50% | 50% | 19% | 19% | 6% | 6% |
| OpenGL 4.4 | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 13% | 13% | 50% | 0% |
| OpenGL 4.3 | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 62% | 71% | 52% | 0% |
| OpenGL 4.2 | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 92% | 100% | 75% | 8% |
| OpenGL 4.1 | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 50% | 83% |
| OpenGL 4.0 | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 69% | 100% |
| OpenGL 3.3 | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| OpenGL 3.2 | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |



Nomenclature:

Supported

Not supported

Support added from previous report

| OpenGL Extensions | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KHR_texture_compression_astc_ldr | X | X | X | X | X | X | X | X | X | X | X | X |
| ARB_robustness | V | V | V | X | X | X | X | X | V | V | X | X |
| ARB_sparse_texture | V | V | V | X | X | V | V | V | X | X | X | X |
| ARB_shading_language_include | V | V | V | X | X | X | X | X | X | X | X | V |
| ARB_shader_stencil_export | X | X | X | V | V | V | V | V | X | X | X | X |
| ARB_shader_group_vote | V | V | V | X | X | V | V | V | X | X | X | X |
| ARB_shader_draw_parameters | V | V | V | X | X | V | V | V | X | X | X | X |
| ARB_seamless_cubemap_per_texture | X | V | V | V | V | V | V | V | X | X | X | X |
| ARB_robustness_isolation | V | V | V | X | X | X | X | X | X | X | X | X |
| ARB_robust_buffer_access_behavior | V | V | V | X | X | X | X | X | X | X | X | X |
| ARB_debug_output | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_indirect_parameters | V | V | V | X | X | X | X | X | X | X | X | X |
| ARB_compute_variable_group_size | V | V | V | X | X | X | X | X | X | X | X | X |
| ARB_compatibility | V | V | V | V | V | V | V | V | V | V | X | X |
| ARB_cl_event | X | X | X | X | X | X | X | X | X | X | X | X |
| ARB_bindless_texture | X | V | V | X | X | V | V | V | X | X | X | X |
| Support | 69% | 81% | 81% | 25% | 25% | 50% | 50% | 50% | 19% | 19% | 6% | 6% |

| OpenGL Extensions | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXT_texture_sRGB_decode | V | V | V | V | V | V | V | V | V | V | X | V |
| EXT_texture_mirror_clamp | V | V | V | V | V | V | V | V | X | X | X | V |
| EXT_shader_integer_mix | V | V | V | V | V | V | V | V | V | V | V | X |
| EXT_shader_image_load_formatted | X | X | V | X | X | X | X | X | X | X | X | X |
| EXT_framebuffer_multisample_blit_scaled | V | V | V | X | X | X | X | X | X | X | X | V |
| EXT_direct_state_access | V | V | V | V | V | V | V | V | X | X | X | X |
| EXT_depth_bounds_test | V | V | V | X | X | V | V | V | X | X | X | V |
| EXT clip_control | X | X | X | X | X | X | X | X | V | V | X | X |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NV_vertex_buffer_unified_memory | V | V | V | X | X | X | X | X | X | X | X | X | |
| NV_texture_multisample | V | V | V | X | X | X | X | X | X | X | X | X | |
| NV_texture_barrier | V | V | V | V | V | V | V | V | X | X | X | V | |
| NV_shader_thread_shuffle | X | V | V | X | X | X | X | X | X | X | X | X | |
| NV_shader_thread_group | V | V | V | X | X | X | X | X | X | X | X | X | |
| NV_shader_buffer_store | V | V | V | X | X | X | X | X | X | X | X | X | |
| NV_shader_buffer_load | V | V | V | X | X | X | X | X | X | X | X | X | |
| NV_shader_atomic_float | V | V | V | X | X | X | X | X | X | X | X | X | |
| NV_multisample_coverage | V | V | V | X | X | X | X | X | X | X | X | X | |
| NV_explicit_multisample | V | V | V | V | V | V | V | V | X | X | X | X | |
| NV_depth_buffer_float | V | V | V | V | V | V | V | V | X | X | X | X | |
| NV_copy_image | V | V | V | V | V | V | V | V | X | X | X | X | |
| NV_bindless_texture | X | V | V | X | X | X | X | X | X | X | X | X | |
| NV_bindless_multi_draw_indirect | V | V | V | X | X | X | X | X | X | X | X | X | |
| NV_blend_equation_advanced | V | V | V | X | X | X | X | X | X | X | X | X | |
| INTEL_map_texture | X | X | X | X | X | X | X | X | X | V | X | X | |
| INTEL_fragment_shader_ordering | X | X | X | X | X | V | V | V | V | V | X | X | |
| INTEL_conservative_rasterization | X | X | X | X | X | X | X | X | X | V | X | X | |
| AMD_vertex_shader_viewport_index | X | X | X | V | V | V | V | V | X | X | X | X | |
| AMD_vertex_shader_layer | X | X | X | V | V | V | V | V | X | X | X | X | |
| AMD_transform_feedback4 | X | X | X | X | X | V | V | V | X | X | X | X | |
| AMD_transform_feedback3_lines_triangles | X | X | X | X | V | V | V | V | X | X | X | X | |
| AMD_stencil_operation_extended | X | X | X | X | X | V | V | V | X | X | X | X | |
| AMD_sparse_texture_pool | X | X | X | X | X | X | V | V | X | X | X | X | |
| AMD_sparse_texture | X | X | X | X | X | V | V | V | X | X | X | X | |
| AMD_shader_trinary_minmax | X | X | X | X | X | V | V | V | X | X | X | X | |
| AMD_shader_stencil_value_export | X | X | X | X | X | V | V | V | X | X | X | X | |
| AMD_shader_stencil_export | X | X | X | V | V | V | V | V | X | X | X | X | |
| AMD_seamless_cubemap_per_texture | X | V | V | V | V | V | V | V | X | X | X | X | |
| AMD_sample_positions | X | X | X | V | V | V | V | V | X | X | X | X | |
| AMD_query_buffer_object | X | X | X | V | V | V | V | V | X | X | X | X | |
| AMD_pinned_memory | X | X | X | V | V | V | V | V | X | X | X | X | |
| AMD_occlusion_query_event | X | X | X | X | X | X | V | V | X | X | X | X | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AMD_interleaved_elements | X | X | X | X | X | V | V | V | X | X | X | X |
| AMD_gpu_shader_int64 | X | X | X | X | X | V | V | V | X | X | X | X |
| AMD_gcn_shader | X | X | X | X | X | V | V | V | X | X | X | X |
| AMD_framebuffer_sample_positions | X | X | X | X | X | V | V | V | X | X | X | X |
| AMD_blend_minmax_factor | X | X | X | X | V | V | V | V | X | X | X | X |
| ATI_texture_mirror_once | V | V | V | V | V | V | V | V | X | X | X | V |
| Support | 49% | 57% | 59% | 32% | 35% | 59% | 62% | 62% | 11% | 14% | 3% | 11% |

| OpenGL 4.4 | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_buffer_storage | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_clear_texture | V | V | V | V | V | V | V | V | X | X | X | X |
| ARB_enhanced_layouts | V | V | V | V | V | V | V | V | X | X | X | X |
| ARB_multi_bind | V | V | V | V | V | V | V | V | X | X | X | X |
| ARB_query_buffer_object | V | V | V | V | V | V | V | V | X | X | X | X |
| ARB_texture_mirror_clamp_to_edge | V | V | V | V | V | V | V | V | X | X | V | X |
| ARB_texture_stencil8 | V | V | V | V | V | V | V | V | X | X | V | X |
| ARB_vertex_type_10f_11f_11f_rev | V | V | V | V | V | V | V | V | X | X | V | X |
| Support | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 13% | 13% | 50% | 0% |

| OpenGL 4.3 | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_vertex_attrib_binding | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_texture_view | V | V | V | V | V | V | V | V | X | X | V | X |
| ARB_texture_storage_multisample | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_texture_query_levels | V | V | V | V | V | V | V | V | X | X | V | X |
| ARB_texture_buffer_range | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_stencil_texturing | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_shader_storage_buffer_object | V | V | V | V | V | V | V | V | X | V | X | X |
| ARB_shader_image_size | V | V | V | V | V | V | V | V | V | V | X | X |
| ARB_program_interface_query | V | V | V | V | V | V | V | V | V | V | X | X |
| ARB_multi_draw_indirect | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_invalidate_subdata | V | V | V | V | V | V | V | V | X | X | V | X |
| ARB_internalformat_query2 | V | V | V | V | V | V | V | V | V | V | X | X |
| ARB_framebuffer_no_attachments | V | V | V | V | V | V | V | V | V | V | X | X |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_fragment_layer_viewport | V | V | V | V | V | V | V | V | X | X | X | X |
| ARB_explicit_uniform_location | V | V | V | V | V | V | V | V | X | X | X | X |
| ARB_ES3_compatibility | V | V | V | V | V | V | V | V | V | V | V | X |
| KHR_debug | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_copy_image | V | V | V | V | V | V | V | V | V | V | X | X |
| ARB_compute_shader | V | V | V | V | V | V | V | V | X | V | X | X |
| ARB_clear_buffer_object | V | V | V | V | V | V | V | V | X | X | V | X |
| ARB_arrays_of_arrays | V | V | V | V | V | V | V | V | V | V | X | X |
| Support | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 62% | 71% | 52% | 0% |

| OpenGL 4.2 | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_transform_feedback_instanced | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_texture_compression_bptc | V | V | V | V | V | V | V | V | V | V | X | X |
| ARB_texture_storage | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_shading_language_packing | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_shading_language_420pack | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_shader_image_load_store | V | V | V | V | V | V | V | V | X | V | X | X |
| ARB_shader_atomic_counters | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_map_buffer_alignment | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_internalformat_query | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_conservative_depth | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_compressed_texture_pixel_storage | V | V | V | V | V | V | V | V | V | V | X | X |
| ARB_base_instance | V | V | V | V | V | V | V | V | V | V | V | X |
| Support | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 92% | 100% | 75% | 8% |

| OpenGL 4.1 | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_viewport_array | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_vertex_attrib_64bit | V | V | V | V | V | V | V | V | V | V | X | V |
| ARB_shader_precision | V | V | V | V | V | V | V | V | V | V | X | V |
| ARB_separate_shader_objects | V | V | V | V | V | V | V | V | V | V | X | V |
| ARB_get_program_binary | V | V | V | V | V | V | V | V | V | V | V | X |
| ARB_ES2_compatibility | V | V | V | V | V | V | V | V | V | V | V | V |
| Support | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 50% | 83% |

| OpenGL 4.0 | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_transform_feedback3 | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_transform_feedback2 | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_texture_query_lod | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_texture_gather | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_texture_cube_map_array | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_texture_buffer_object_rgb32 | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_tessellation_shader | V | V | V | V | V | V | V | V | V | V | X | V |
| ARB_shader_subroutine | V | V | V | V | V | V | V | V | V | V | X | V |
| ARB_sample_shading | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_gpu_shader5 | V | V | V | V | V | V | V | V | V | V | X | V |
| ARB_gpu_shader_fp64 | V | V | V | V | V | V | V | V | V | V | X | V |
| ARB_draw_indirect | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_draw_buffers_blend | V | V | V | V | V | V | V | V | V | V | V | V |
| Support | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 69% | 100% |

| OpenGL 3.3 | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_vertex_type_2_10_10_10_rev | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_timer_query | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_texture_swizzle | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_texture_rgb10_a2ui | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_shader_bit_encoding | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_sampler_objects | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_occlusion_query2 | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_instanced_arrays | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_explicit_attrib_location | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_blend_func_extended | V | V | V | V | V | V | V | V | V | V | V | V |
| Support | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

| OpenGL 3.2 | GF | GK | GM | EG | N.I. | S.I. | C.I. | V.I. | IVB | HSW | Mesa | MacOS X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_vertex_array_bgra | V | V | V | V | V | V | V | V | V | V | V | V |
| ARB_texture_multisample | V | V | V | V | V | V | V | V | V | V | V | V |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARB_sync | V | V | V | V | V | V | V | V | V | V | V | | V | |
| ARB_seamless_cube_map | V | V | V | V | V | V | V | V | V | V | V | | V | |
| ARB_provoking_vertex | V | V | V | V | V | V | V | V | V | V | V | | V | |
| ARB_geometry_shader4 | V | V | V | V | V | V | V | V | V | V | V | | V | |
| ARB_fragment_coord_conventions | V | V | V | V | V | V | V | V | V | V | V | | V | |
| ARB_depth_clamp | V | V | V | V | V | V | V | V | V | V | V | | V | |
| ARB_draw_elements_base_vertex | V | V | V | V | V | V | V | V | V | V | V | | V | |
| Support | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | | 100% | | 100% |