Vulkan 1.3 Launch
Strengthening the Vulkan Ecosystem
25 January 2022
Vulkan is Everywhere

Desktop and Mobile GPUs and SOCs

Note: The version of Vulkan available will depend on platform and vendor

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http://vulkan.gpuinfo.org/
Vulkan is Unique

Vulkan is the only open standard modern GPU API
Under multi-company governance
Supported by all major GPU vendors
Cross-platform support reduces developer porting effort and costs
Used extensively by games and applications

Vulkan’s pervasiveness across multiple platforms and markets creates unique ecosystem challenges
Vulkan 1.3 increases the rigor of Vulkan ecosystem and roadmap management
Ecosystem and Roadmap Pre-Vulkan 1.3

Core Vulkan

- Fully acceleratable on OpenGL ES 3.1 hardware for pervasive availability in multiple markets including mobile
- No clearly communicated roadmap for hardware evolution past OpenGL ES 3.1
- Optional core features signal functionality that may become pervasive
- No guarantee of WHEN that functionality will be pervasive and on WHAT platforms

Vulkan Extensions

- Expose new hardware functionality and API improvements for developers
- Extensions are optional, so availability varies by vendor, platform and across markets such as desktop and mobile
- Over 180 Vulkan KHR and EXT extensions plus over 100 vendor extensions

Vulkan’s continued diverse expansion and evolution complicates how developers can know WHERE and WHEN functionality will be reliably available
Vulkan 1.3 Ecosystem Evolution

Vulkan 1.3 Core Specification
Brings proven and requested extensions into core with *mandated* support for consistent widespread availability

Vulkan Roadmap 2022 Milestone
*Agreed* support for extensions beyond Vulkan 1.3 for mid- to high-end mobile and desktop devices starting in 2022

Google’s Android Baseline 2021 Profile
Specifies features beyond Vulkan 1.0 that are supported by large majority of active devices in the Android ecosystem

Continuing diverse innovation in Vulkan Extensions

Significantly enhanced guidance for WHERE and WHEN Vulkan functionality will be supported for reduced fragmentation for streamlined development of portable applications

Beyond Vulkan 1.3
- Future Core Specifications with mandated pervasive functionality
- Ongoing shorter- and longer-term roadmap guidance
- Future Profile Specifications defined and used by markets, platforms, IHVs and ISVs
Vulkan 1.3 Core Specification

Supportable on OpenGL ES 3.1-class hardware
For widespread deployment

Integrates significant requested functionality proven as extensions
Mandated support for new functionality ensures availability on all Vulkan 1.3 implementations

Dynamic rendering to enable simplified API use without subpasses
Dynamic State reduces number of needed pipeline objects to avoid hitching
Streamlined management of shader pipeline compilations
Buffer device addresses to use pointers
Finer control over subgroup sizes and mapping
Dot product function for efficient machine learning acceleration
Synchronization2 API for easier queue submission, events, and pipeline barriers
And more... 23 extensions in total

Conformant Vulkan 1.3 beta drivers shipping from multiple vendors, including
AMD and NVIDIA, that support the Vulkan Roadmap 2022 milestone
Vulkan Roadmap 2022 Milestone

Working Group-agreed support for a new functionality baseline Beyond Vulkan 1.3

For mid- to high-end mobile and desktop devices with rollout starting in 2022

Vulkan 1.3 specification includes list of additional extensions with mandated limits and formats (e.g., raised minimums for image dimensions and subgroup size)

Significant jump in functionality

Descriptor Indexing for ‘bindless’ operations

Cross-vendor subgroup consistency: minimum size, shader support and supported operations

Multiple process scheduling

And much more...

Anisotropic filtering, Y’CBCR sampling, buffer scalar block layouts, depth and depth bias clamping, mirror-clamp-to-edge sampling, independent blending, sample rate shading, precise occlusion queries, fragment stores and atomics, standard sample locations, and full 32-bit draw indices

The first of an ongoing series of Vulkan roadmap specifications and guidance documents giving roadmap guidance
Vulkan Roadmap Guidance Pipeline

**Longer Term**
Use case-driven general guidance
Sufficient lead time to affect silicon designs

**Shorter Term**
Define roadmap milestone profiles
Software changes only

**Core Specifications**
Selected pervasive functionality

Vulkan Working Group will develop and maintain a public pipeline of roadmap guidance documentation
Vulkan Profile Specifications

Profiles
Machine-readable specifications to precisely specify and manage set of API capabilities
- Core Vulkan spec version +
- Extension list +
- Defined limits, features and formats
Profile specifications don’t define new API calls

Generate Human-readable Versions of Profiles
E.g., Google’s Android Baseline 2021 Profile

Vulkan 1.3 SDK
Profile Tooling
Shipping mid-February
Detect if Profile is supported by a device
Enable a Profile on a device
Layer to simulate a Profile on a higher capability device

Profiles have Multiple Potential Uses
- Roadmap Definitions
  When Milestones can be precisely defined
- Platform Definitions
  Recommendations for wide device compatibility
- Market Segment Definitions
  Consensus baseline supported functionality
- IHV Documentation
  Functionality supported by devices
- ISV Documentation
  Functionality needed by applications

The use of Profiles to precisely communicate functionality requirements will evolve over time
Android Baseline 2021 Profile

Google-defined Vulkan Profile for the Android platform
Defines functionality beyond Vulkan 1.0 supported on the vast majority of current Android devices
Even without the need for an over-the-air updates
Built-in collaboration with Khronos partners to ensure the greatest support for all future devices

Simplified developer experience
Reduces dozens of API queries to just a few
Consistent support for dozens of different limits and formats
Sensible defaults set to reduce implicit assumptions and cognitive load for developers

Pushing Vulkan on mobile forward
Compressed textures through ASTC and ETC
Variable colorspace through VK_EXT_swapchain_colorspace
Sample shading and multisample interpolation through sampleRateShading
Dozens of other Vulkan extensions, features, limits, and formats

The Android Baseline 2021 Profile makes it easy for developers to create an application that supports the vast majority of currently active Android devices

https://developer.android.com/ndk/guides/graphics/android-baseline-profile
More Information

- Vulkan: [https://www.vulkan.org/](https://www.vulkan.org/)
  - Press Release: [https://khr.io/xj](https://khr.io/xj)
  - Final specification: [https://khr.io/vulkan13spec](https://khr.io/vulkan13spec)
  - Spec GitHub Repo: [https://khr.io/vulkan13github](https://khr.io/vulkan13github)
  - Discord Link for community discussion: [https://khr.io/vulkan13discord](https://khr.io/vulkan13discord)
  - Vulkan 1.3 Blog post: [https://www.khronos.org/blog/vulkan-1.3-and-roadmap-2022](https://www.khronos.org/blog/vulkan-1.3-and-roadmap-2022)
  - Google Android Baseline 2021 Profile blog: [https://www.khronos.org/blog/vulkan-1.3-and-roadmap-2022](https://www.khronos.org/blog/vulkan-1.3-and-roadmap-2022)

Free Vulkanised Webinar on February 1, 2022
Will go into more depth on all these updates!
Registration is open here
[https://www.khronos.org/events/vulkanised-webinar-february-2022](https://www.khronos.org/events/vulkanised-webinar-february-2022)