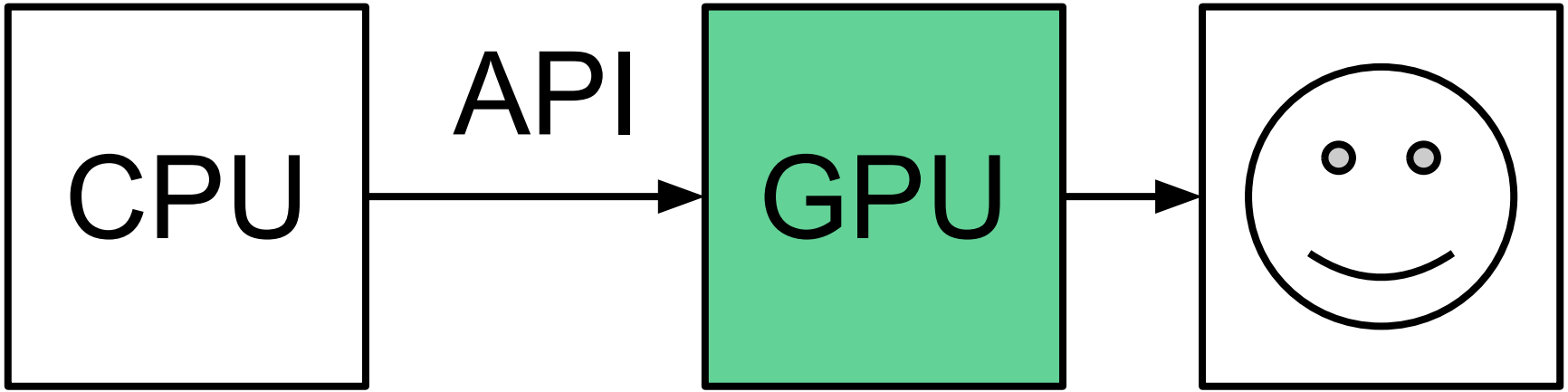
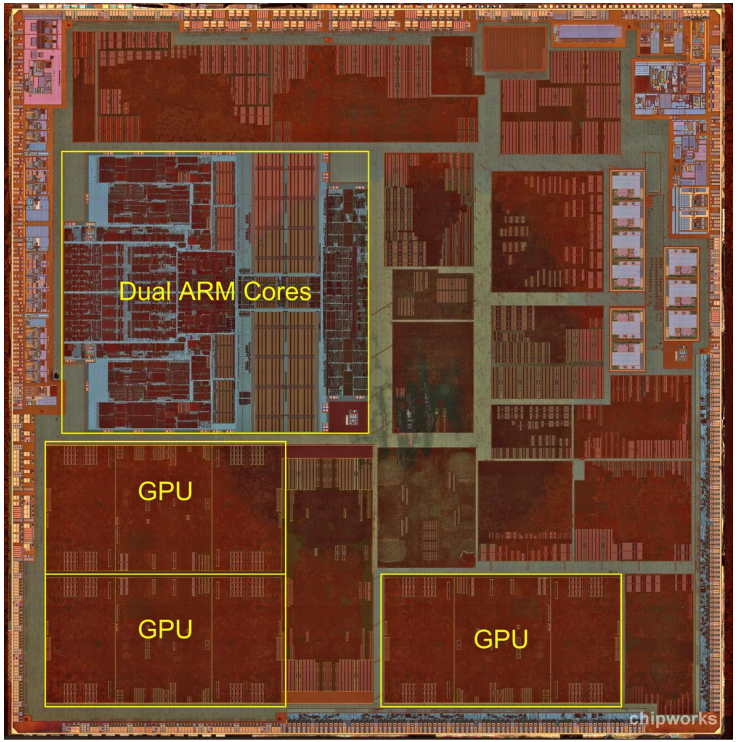
Graphics Processing Unit

Video Game Graphics AD-011


CPU
API
GPU

Desktop

Mobile



History

1970s - First accelerators
1990s - Voodoo cards with Glide API
1990s - OpenGL & DirectX
2000s - Term GPU by Nvidia (VPU was term used by ATI)
2005 - OpenGL ES (mobile graphics)
2011 - WebGL (OGLES 2.0 based)
2016 - Vulkan

Specialized parallel architecture

- Math computations are float and matrix oriented
- No execution jumps (no if statements)
- Massive number of independent threads
- Might contain thousands of cores

Application Programming Interface

Is a “language” of communication between CPU and GPU

- OpenGL - Industry standard
- WebGL - Web
- Vulkan - Industry standard new generation
- DirectX - Microsoft proprietary
- Metal - Apple proprietary
- GNM - Sony proprietary

Shader Language

Is a programming language for programs executed by GPU

- GLSL - Industry standard for OpenGL
- HLSL - Microsoft proprietary for DirectX
- Cg - Deprecated by Nvidia, still used by Unity3D
- MSL - Apple proprietary for Metal
- PSSL - Sony for PlayStation 4
- Vulkan has no specific shader language

Previous generation

- OpenGL
- DirectX pre 12

Next generation

- Vulkan
- Metal
- DirectX 12

Why we need new APIs?

- Hardware went far ahead while old APIs were designed for simpler GPUs
- Old APIs were not designed for multicore CPUs
- Advanced features are hidden
- Some outdated pipeline steps could be eliminated

Compute shaders

- GPU programs used for other purposes than graphics
- May use different data types (only floats used for graphics)
- Used for artificial neural networks
- Bitcoin mining paradise $$$;)