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Summary:

Staff SWE with 17 years of experience in real-time computer graphics, designing graphic APIs (OpenGL/ES, Direct3D, Metal) and implementing them through whole driver stack on Windows and macOS. Designed real-time SW stack for XR (Apple equivalent of OpenXR) and lead team of engineers implementing it. Experience writing game engines and renderers (latest utilizing Vulkan and Direct3D 12). Reverse engineered and wrote drivers for multiple VR headsets. Implemented SW for E2E latency testing rig. Passionate about low-level, low-latency programming, robotics and biomimetics.

Most recent work experience:

Staff Software Engineer, Apple, Cupertino, CA — **SINCE OCT'19**

- Currently working with AIML division on new Apple Neural Engine (ANE) driver architecture (with focus on resources residency, workloads scheduling and dependency tracking).
- Previously tech lead for Apple real-time XR (AR/MR/VR) SW stack (for macOS and Vision Pro).
- Designed Apple low-level XR APIs (equivalent of OpenXR), daemon and drivers architecture. This included design of pixel-pipeline (Compositor), tracking pipeline, and input & control pipeline.
- Experience leading team of engineers implementing mentioned XR stack.
- Experience implementing LED and Lighthouse based tracking systems (pose estimation). Used algorithms like: EPnP, MPFIT, Kalman Filters (also Lambda Twist, Madgwick and Mahony for IMU).
- Prototyped remote rendering infrastructure with custom transfer protocol, underlying transfer layer (TCP/QUIC, AWDL, USB) with video stream compression (x264/HEVC, AADT). Employed latency minimization techniques (low latency video encoding, multi-streams, retransmission avoidance, etc.).
- Experience in Reverse-Engineering and writing device drivers (USB Bulk, HID).

Senior Software Engineer, Apple, Cupertino, CA — **OCT'14 - OCT'19**

- Member of GPU SW Architecture Team.
- Tech lead for shipping VR support in macOS 10.13 and VivePro adoption on macOS 10.14.
- Responsible for cooperation with Valve, HTC, Unity, Epic Games and other VR vendors.
- Worked on porting SteamVR to macOS, with focus on performance analysis and optimizations.
- Co-designed and lead development of Metal APIs for XR (Shareable Metal Textures, Variable Rasterization Rate, Vertex Amplification, MSAA 2D Array textures, etc.).
- In the past, researched and implemented Metal API's like Memoryless Rendertargets (iOS 10.0), Resource Sub-Allocation Heaps (iOS 10.0 and macOS 10.13) and others.
- Supported iOS and macOS drivers on all four GPU architectures**.**
- Cooperated with Epic Games on enabling Unreal Engine 4 Metal RHI on macOS 10.11+.

Senior Graphics SWE, Intel, Gdańsk, Poland — **APR'14 - OCT'14**

- Researched new HW features for future Intel GPU's (up to Gen 11 IceLake).
- Implemented their support through whole driver stack (HLSL compiler, DX ASM interpreter, compiler, backend assembly generation and state support) as well as in HW simulator.
- Wrote functional tests and microbenchmarks. Made performance measurements and predictions.
- As member of KHRONOS Group contributed to OpenGL 4.4 Core and ES 3.1 Specifications.

Graphics SWE, Intel, Gdańsk, Poland — **APR'08 - APR'14**

- Worked in Unified Shader Compiler team. Responsible for implementing new OpenGL, ES and GLSL API features in graphic drivers for Intel integrated GPUs from Gen 4.0 Broadwater to Gen 8 Broadwell. This included reviewing OpenGL specifications, filing tasks for new features and managing their progress in the compiler team.

- Earlier, debugged shader compiler issues. Resolved issues related to Intel graphic drivers in renderers of such games like Spore, Oblivion, Star Craft II and more.

CEO, Polish Conference on Computer Games Development, Poland **SEP'10 - SEP'14**

- Website archived at: https://web.archive.org/web/20181112093849/http://wgk2011.eti.pg.gda.pl/
- Conference for polish video game industry gathering 500 attendees from over 60 companies.
- Responsible for acquiring sponsors and speakers, communication with companies, event promotion, managing team of 9 people and 30 volunteers.
- Promoting polish game industry abroad. Organized delegation of 8 polish companies to Deutsche Gamestag 2013

Education:

M.Sc. in Computer Science, Intelligent Interactive Systems **SEP'05 - MAR'10**
Technical University of Gdańsk, faculty of Electronics, Telecommunications and Informatics

- Graduated in March, three months ahead of schedule. Master thesis describes author algorithm of terrain visualization (see details on LinkedIn).
- Founder and CEO of „Vertex" Scientific Society, lectured at the „Academy of ETI"
- Received Dean award for project: „System of shading 3D scenes - Brightshade"

Patents:

(WO2016007027) METHOD AND APPARATUS FOR UPDATING A SHADER PROGRAM BASED ON CURRENT STATE

(US20230094658) PROTECTED ACCESS TO RENDERING INFORMATION FOR ELECTRONIC DEVICES

Selected private projects:

Ngine **2007 - 2019**

- Multiplatform 3D game engine written in C++ supporting Windows on PC; iOS on iPod/iPhone/iPad; macOS on Mac's; BlackBerry 10 on Z10 and Q10, Android on various Tablets and Smartphones.
- Features Fibers based Task Scheduler; rendering abstraction layer with three backends: D3D12, Vulkan and Metal (OpenGL and OpenGL ES in the past); resource manager for fbx, obj, hdr, exr, png, tga, wav, etc.; mesh optimization algorithms; 3D audio based on OpenAL; support for wide range of sensors including Kinect, RealSense, Oculus Rift and Vive/VivePro.
- Used in all private games and projects.

ACD Operating System **2005 - 2007**

- Microkernel of Operating System written in NASM. Supports preemptive multi-tasking, Inter-Process Communication with priorities, ports protection and Virtual Memory in Virtual Process Space.

Technical Skills:

Languages:	C/C++, Assembly (NASM), Pascal, QBasic
Scripting:	Python, LaTeX, LUA, PHP, HTML, CSS
Graphic API's:	Metal, Vulkan, Direct3D 12 (HLSL), OpenGL (GLSL), OpenGL ES, Cg
Debugging:	Visual Studio Remote Debugging, VisualGDB, LLDB/GDB, WinDbg
GPU Debugging:	PIX, IGPA, gDEBugger, Xcode Frame Capture, Ariadne (Apple internal)
Version control:	GIT, SourceTree, Perforce, SVN, IBM ClearCase
IDE/Compiler:	Visual Studio 2005-2022, ICC, Eclipse/Momentics, Xcode, gcc
Used utilities:	WinMerge, BeyoundCompare, CodeCollaborator, PuTTY, WinSCP, etc.
Reverse engineering:	Wireshark with USBPcap