Refocusing on VR Innovation

Can Standards Simplify Cross-Platform Virtual Reality Development?

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Refocusing on VR Innovation

Can Standards Simplify Cross-Platform Virtual Reality Development?

Alon Or-bach, Samsung Electronics

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Today's session

- **How open standards are currently enabling VR**
- **Vulkan features to enable VR apps and compositors**
- **OpenXR - Khronos' standard effort for VR applications**
- **Tribute to Johannes van Waveren**
- **Panel discussion - get your questions ready!**

Can Standards Simplify Cross-Platform Virtual Reality Development?

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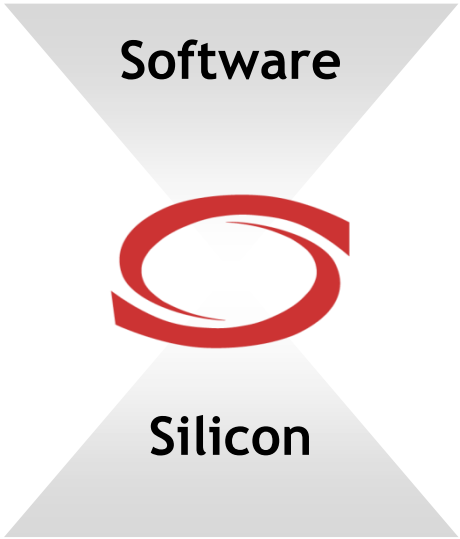
Connecting Software to Silicon



Khronos is an Industry Consortium of over 100 companies

We create royalty-free, open standard APIs for hardware acceleration of

Graphics, Parallel Compute, Neural Networks and Vision

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Khronos Standards Ecosystem

3D for the Web
- Real-time apps and games in-browser
- Efficiently delivering runtime 3D assets

COLLADA
WebGL
glTF

Real-time 2D/3D
- Cross-platform gaming and UI
- VR and AR Displays
- CAD and Product Design
- Safety-critical displays

OpenGL ES
Vulkan
OpenGL SC
OpenGL
OpenVG

NNEF
OpenVX
OpenXR

VR, Vision, Neural Networks
- VR/AR system portability
- Tracking and odometry
- Scene analysis/understanding
- Neural Network inferencing

SPIR
OpenCL
SYCL

Parallel Computation
- Machine Learning acceleration
- Embedded vision processing
- High Performance Computing (HPC)

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Open standards are already enabling VR

- **OpenGL ES and OpenGL powering VR on millions of devices**
  - SteamVR Beta now using Vulkan
- **WebVR**
  - VR in browsers power by WebGL
- **Features used by VR compositors**
  - Context priority
  - Front buffer rendering
  - Tiled rendering (beam racing)
- **Features for VR app rendering**
  - Multiview

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Vulkan featured released related to VR

- **"KHX" experimental extensions**
  - Keen to get developer feedback
  - **Will** be removed when functionality finalized
- **External sharing extensions**
  - VK_KHX_external_memory*
  - VK_KHX_external_semaphore*
  - VK_KHX_win32_keyed_mutex
- **Multiview**
  - VK_KHX_multiview
- **More features on their way**
  - Shared presentation, external fence

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Vulkan: Multiview

- **VK_KHX_multiview experimental extension just released!**
  - Accompanied by SPIR-V extension SPV_KHR_multiview
- **Based on GL_OVR_multiview, redefined to use render passes**
  - Commands executed across multiple views
  - Shaders can differ per-view using ViewIndex
- **Aim to achieve best performance across differing implementations**

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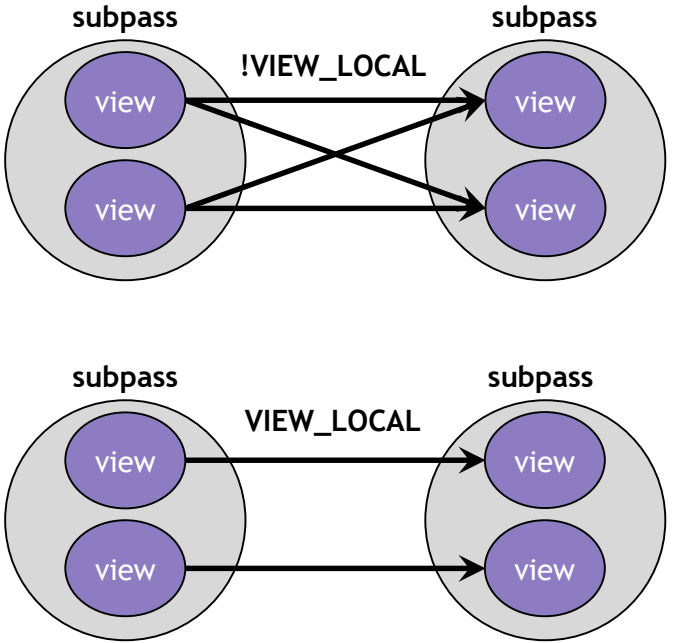
Vulkan: Multiview

- Enables recording command buffers that differ between views
- Introduces mechanism to associate render pass with multiple views
- Supports tiling-friendly VIEW_LOCAL dependencies



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Vulkan: GDC 2017 Khronos Dev Day Sessions

This afternoon, here! (Moscone West, Room 3022)

- **1:20pm Vulkan Game Development on Mobile**
- **2:40pm Vulkan on Desktop Deep Dive**
- **4:00pm When Vulkan was One: Looking Forward, Looking Back**

This afternoon, elsewhere

- **2:40pm The Future of VR & Mobile Graphics** (Room 2011)

Wednesday

- **12:30pm Mobile: The Future of VR** (Room 3007)
- **3:30pm Mobile VR with Unreal Engine & Oculus** (Room 3022)

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Nick Whiting, Epic Games,
OpenXR Working Group Chair

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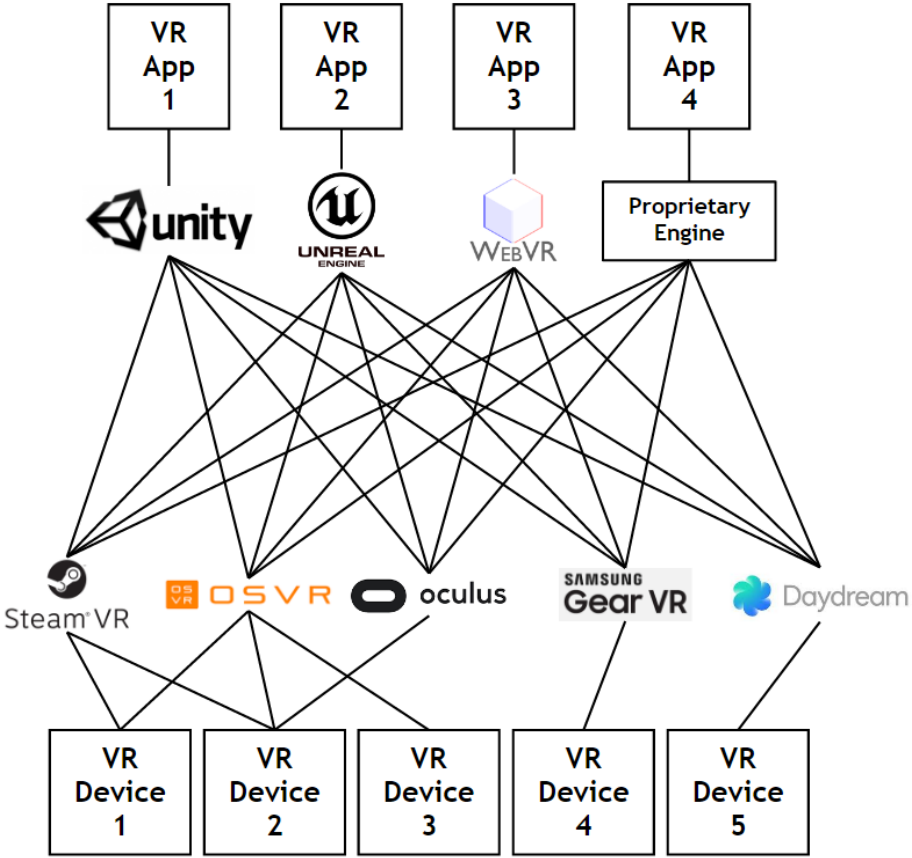

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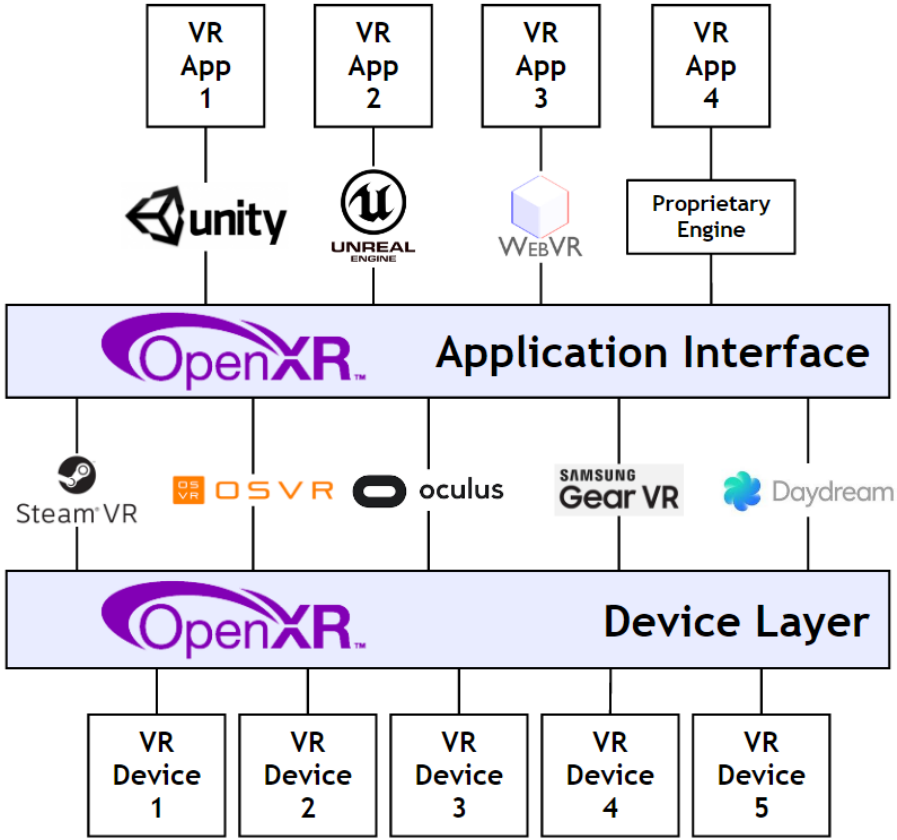

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About Johannes van Waveren

Cass Everitt, Oculus VR

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Johannes == Jan Paul == JP == Mr. Elusive

- JP was many things in his short life
- If you look online, you will be able to find a bunch of the tech stuff
  - See http://mrelusive.com/
- John Carmack has said he was the best programmer he ever knew
  - This praise is *earned*
- We want to honor him today for what he did for us
  - But first, a little about him...

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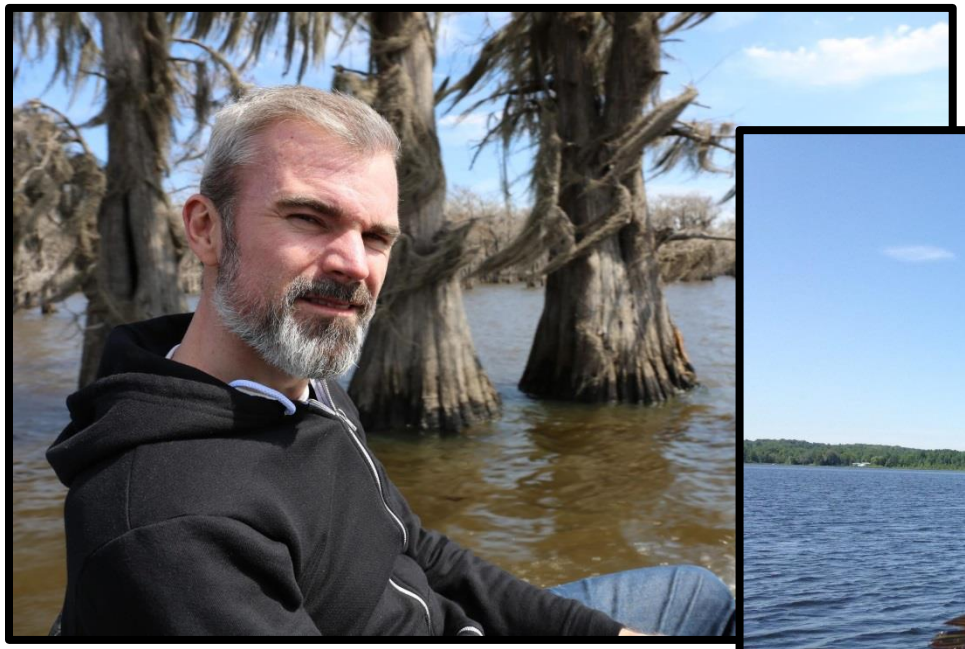
He did stuff… in boats



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At waterfalls, on mountains...

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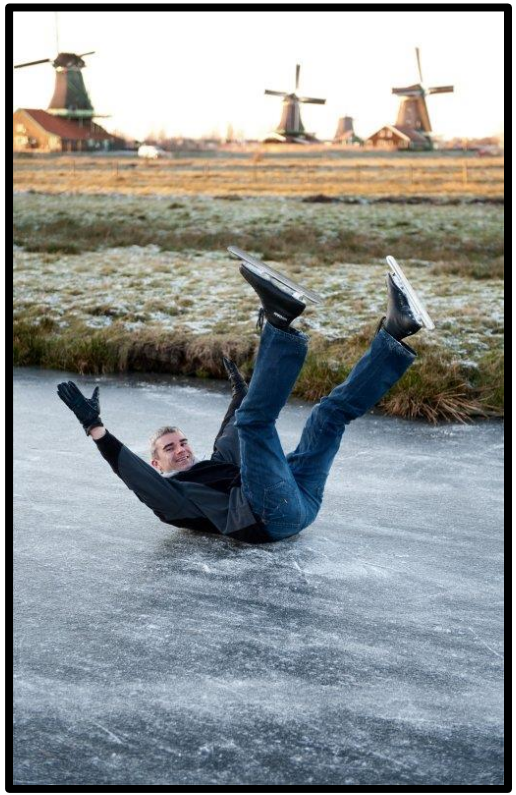
In snow, and on ice…



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He was a friend

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He was Dutch, and he loved rainbow unicorns

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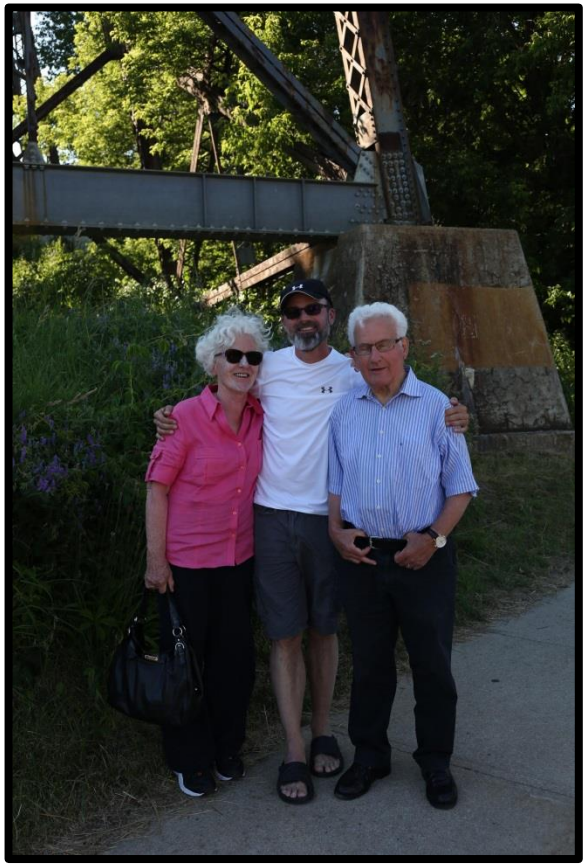
He was a son, and a brother



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A husband, and a father

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He was also funny

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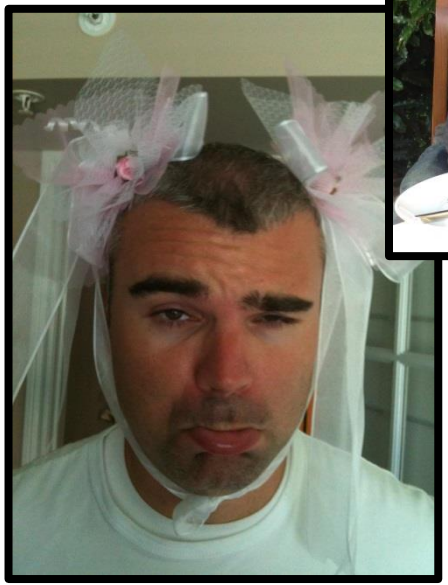
Like, above average funny



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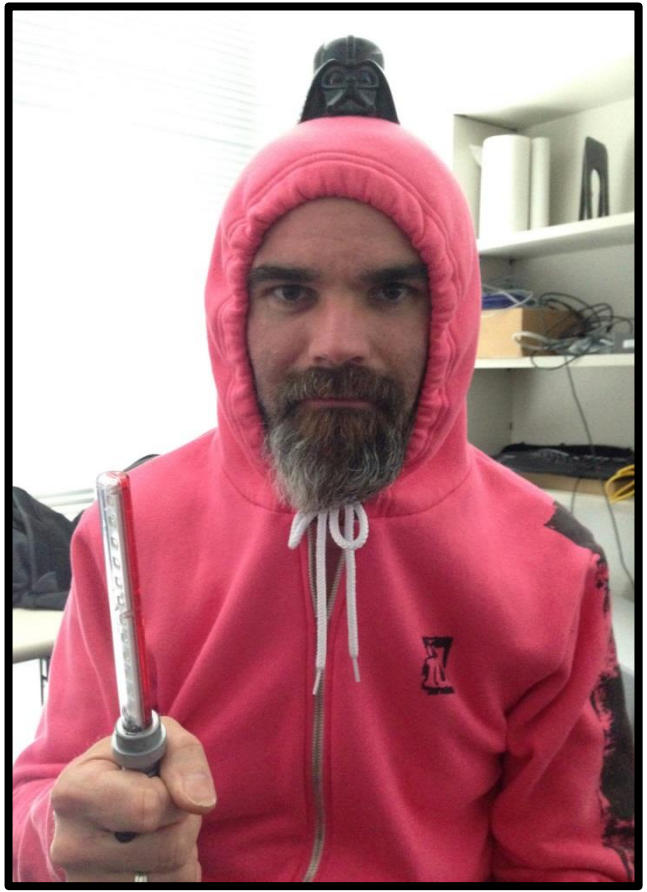
We lost him this January

- After a long battle with colon cancer

- He never stopped living life
- He never stopped looking forward

- He spent the last months of his life (among other things) authoring a proposal for OpenXR
  - Which became the starting point for our standardization effort

- All his friends at Khronos miss him



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Panel Discussion

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Focussing on VR Innovation: Panel discussion

Our panelists

- **Cass Everitt, Oculus VR** @casseveritt
- **Devin Reimer, Owlchemy Labs** @DevinReimer
- **Kaye Mason, Google** @chaleur
- **Joe Ludwig, Valve** @joeludwig
- **Nick Whiting, Epic Games**
- **Yuval Boger, Sensics** @OSVRguy

Chaired by

- **Alon Or-bach, Samsung Electronics** @alonorbach

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