Qualcomm

Qualcomm® Snapdragon™ Technologies

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Qualcomm Technologies, Inc.

Qualcomm Technologies announcements & updates

Snapdragon 845 VRDK for application developers

- New VR development hardware and software supports early VR app development; facilitates content availability for commercial HMDs based on Snapdragon 845 (est. 2H'18)
- **Hardware:** Mobile, standalone HMD built with Snapdragon 845
- **Software:** VR SDK v3.0; Pre-integrated with Wave SDK from HTC Vive

Tobii and Qualcomm Technologies

- **Motivation:** accelerate OEM time to market for Snapdragon VR commercial devices with pre-optimized eye tracking.
- **Innovation:** Demonstration of Snapdragon 845 with Tobii's cutting-edge eye-tracking technology designed to render precise tracking of user's eyes with very low latency

Qualcomm Snapdragon traction in mobile gaming

- Snapdragon 845 with Adreno™ 630 GPU gives gamers the performance they need, in the form factor they want while providing rich, console quality interactive gaming experiences
- **Collaboration:** Netmarble's Lineage 2: Revolution, Netease's Knives Out; Happy Giant's Hologrid Monster Battle
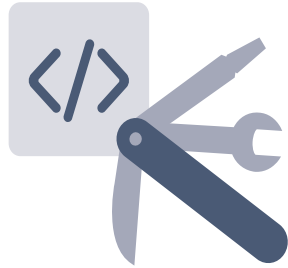
XR Update

Significant progress in XR with Snapdragon

Four (4) Pillar Strategy

Snapdragon 845 Mobile Platform

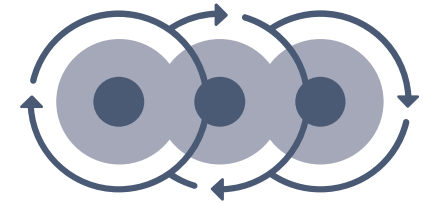Purpose built silicon for superior mobile XR

Snapdragon XR SDK

Easy developer access to Snapdragon accelerated XR libraries that simplify application development

HMD Accelerator Program

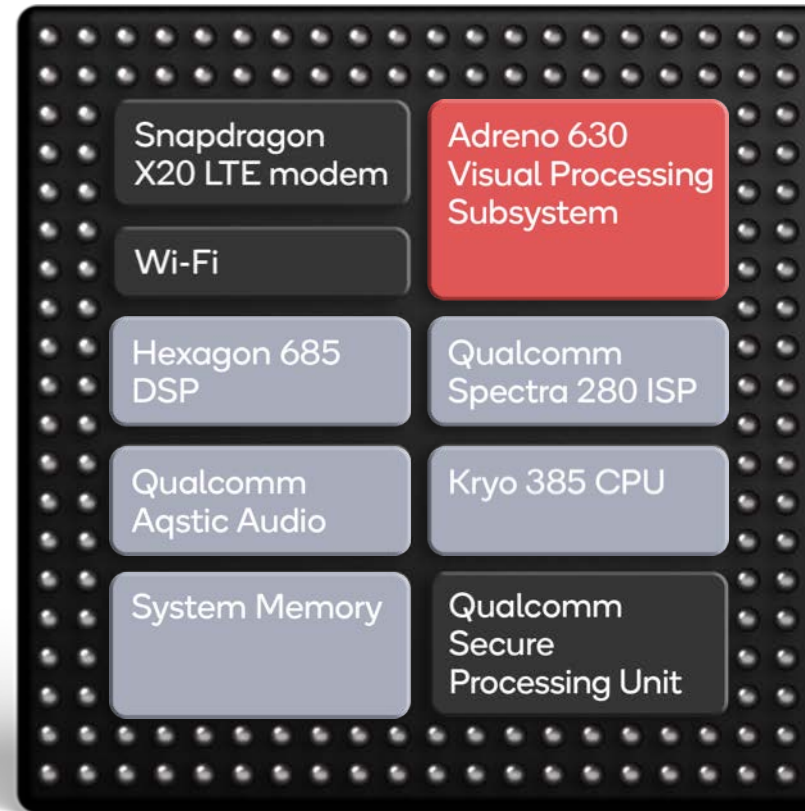Commercialize XR HMDs quickly with fewer resource restraints

Ecosystem & Platform Support

Collaboration with multiple content, technology, and platform companies

Snapdragon 845 Mobile VR Reference Design

Announced at MWC 2018

Snapdragon X20 LTE modem

Wi-Fi

Adreno 630 Visual Processing Subsystem

Hexagon 685 DSP

Qualcomm Spectra 280 ISP

Qualcomm Aqstic Audio

Kryo 385 CPU

System Memory

Qualcomm Secure Processing Unit

Room-Scale 6DOF with SLAM

Adreno Foveation

2K x 2K @ 120 fps XR

30% Faster Graphics and Video*

30% Power Reduction*

Improved 6DOF Hand Tracking and Controller support*

Voice UI with custom keyword

Qualcomm 3D Audio SDK for Unity

*Compared to Snapdragon 835

The new architecture will help support the latest in VR innovation and experiences, maintaining Qualcomm's leadership in the emerging extended reality (XR) market
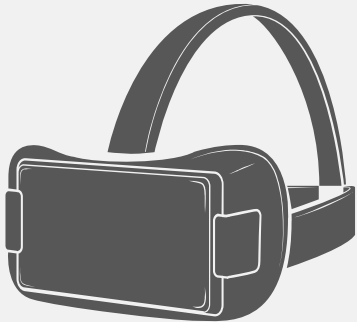
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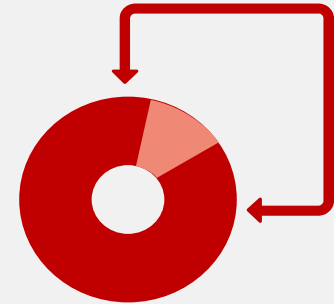# Qualcomm® Snapdragon™ VR Development Kit (VRDK)

Snapdragon VR Development Kit (VRDK)

Early access to VR head mounted display (HMD) supported by upgraded VR software development kit (SDK) that works in combination with the HMD
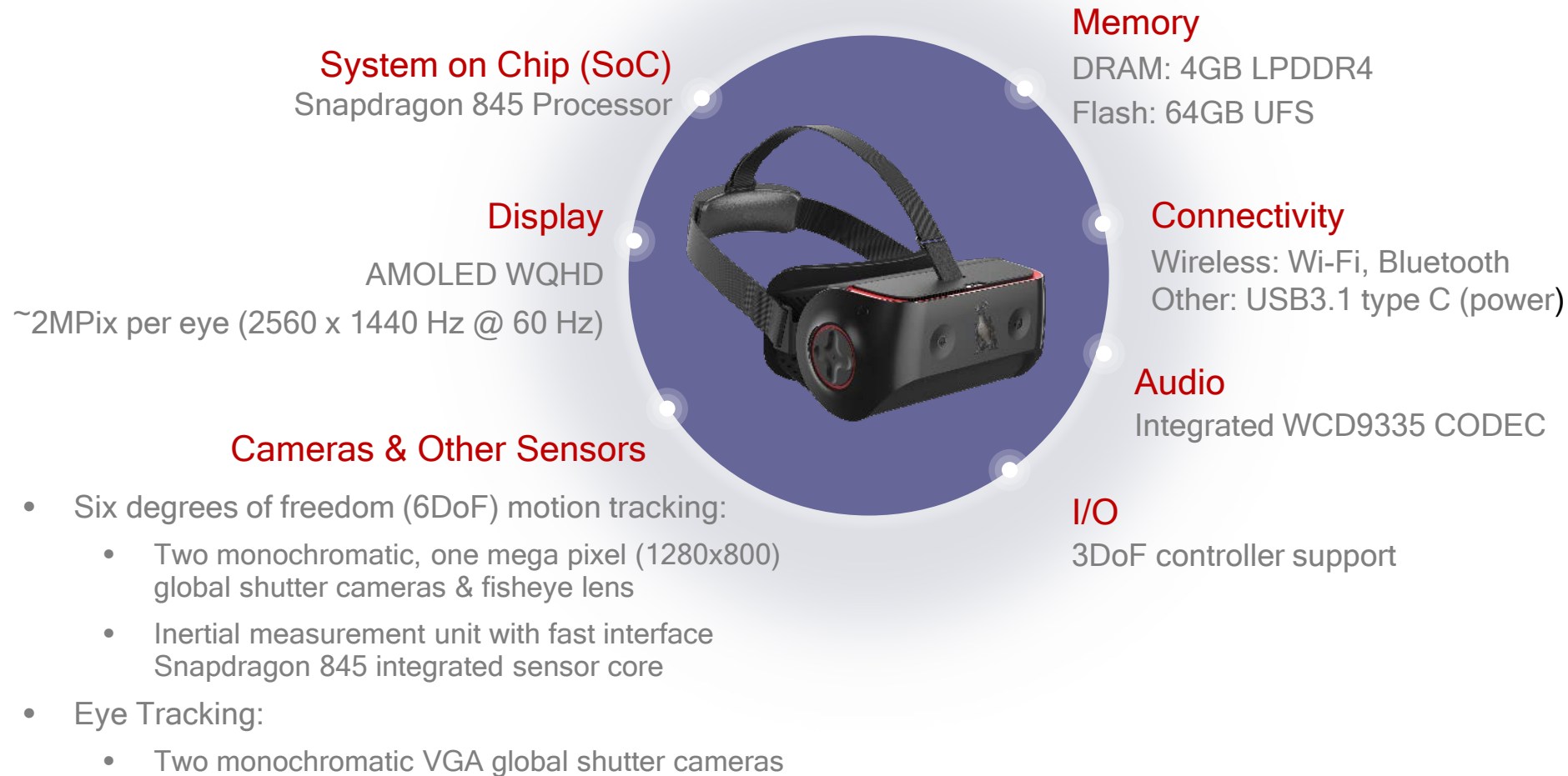
Snapdragon VR HMD

Snapdragon VR SDK
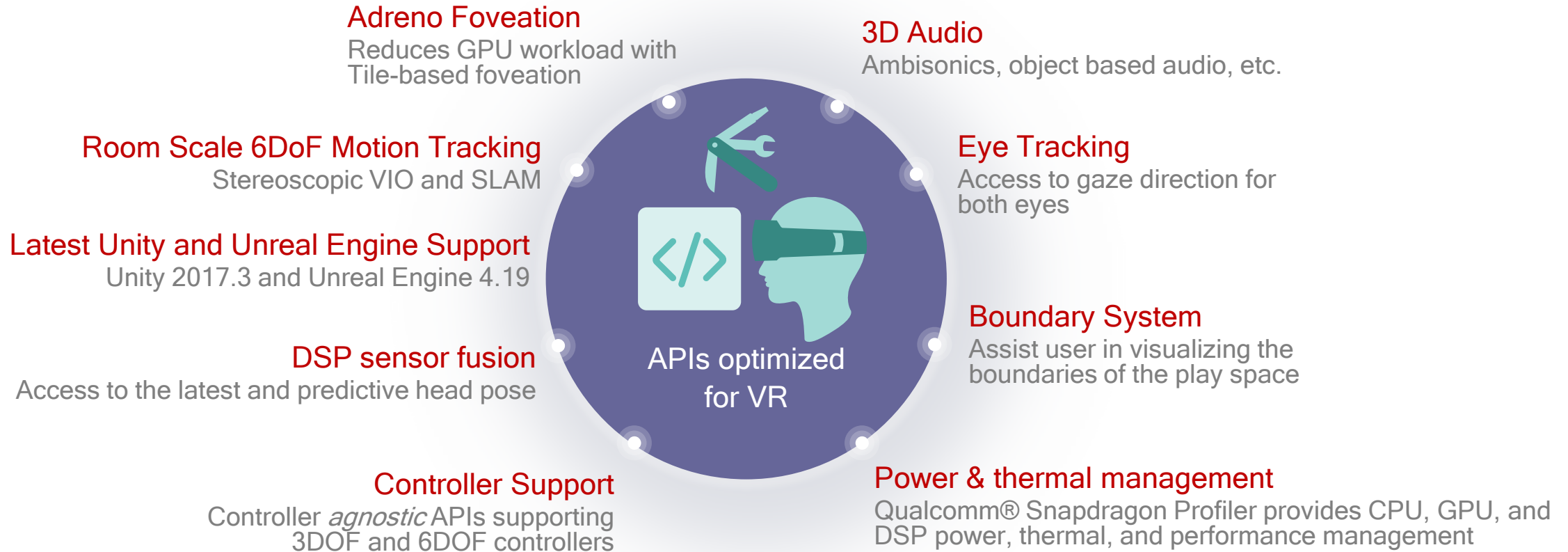
Snapdragon VR Development Kit

Advanced VR features designed to optimize applications and simplify development

System on Chip (SoC)

Snapdragon 845 Processor

Display

AMOLED WQHD

~2MPix per eye (2560 x 1440 Hz @ 60 Hz)

Cameras & Other Sensors

- Six degrees of freedom (6DoF) motion tracking:
  - Two monochromatic, one mega pixel (1280x800) global shutter cameras & fisheye lens
  - Inertial measurement unit with fast interface Snapdragon 845 integrated sensor core
- Eye Tracking:
  - Two monochromatic VGA global shutter cameras

Memory

DRAM: 4GB LPDDR4

Flash: 64GB UFS

Connectivity

Wireless: Wi-Fi, Bluetooth
Other: USB3.1 type C (power)

Audio

Integrated WCD9335 CODEC

I/O

3DoF controller support

Snapdragon VR SDK

Access to advanced VR features to optimize applications and simplify development

Adreno Foveation
Reduces GPU workload with Tile-based foveation

3D Audio
Ambisonics, object based audio, etc.

Room Scale 6DoF Motion Tracking
Stereoscopic VIO and SLAM

Eye Tracking
Access to gaze direction for both eyes

Latest Unity and Unreal Engine Support
Unity 2017.3 and Unreal Engine 4.19

APIs optimized for VR

Boundary System
Assist user in visualizing the boundaries of the play space

DSP sensor fusion
Access to the latest and predictive head pose

Controller Support
Controller *agnostic* APIs supporting 3DOF and 6DOF controllers

Power & thermal management
Qualcomm® Snapdragon Profiler provides CPU, GPU, and DSP power, thermal, and performance management

Benefits

Simplified development | Optimized VR performance | Power and thermal efficiency

Room-scale 6DoF (SLAM)

Room-scale 6DoF (SLAM) for rapid, robust and accurate 6-DoF pose

6DoF pose is generated by mapping the environment, optimizing the map and performing relocalization.

Snapdragon Room-scale 6DoF (SLAM) subsystem

Stereo camera data
Captured from tracking camera image sensors at ~30 fps

Accelerometer & gyroscope data
Sampled from external sensors at 800 / 1000 Hz

Camera feature processing

Inertial data processing

Qualcomm® Hexagon™ DSP algorithms

- Camera and inertial sensor data fusion
- Continuous localization
- Accurate, high-rate "pose" generation & prediction

- Environment mapping
- Continuous map optimizations
- Relocalization

6-DoF position & orientation
(aka "6-DoF pose")

Qualcomm Hexagon is a product of Qualcomm Technologies, Inc.

Benefits of Room-scale 6DoF (SLAM) over 6DoF VIO

Environment Mapping
Map of user's surrounding area is created and optimized for robust inside-out head tracking

Room-scale
Provides ability for users to move in a large room scale space (20x20 ft.)

Relocalization
Prevents error accumulation and continuously update the 6DoF pose and map

Eye Tracking

Snapdragon 845 VR Reference Design provides integrated and optimized eye tracking using Tobii eye tracking solution
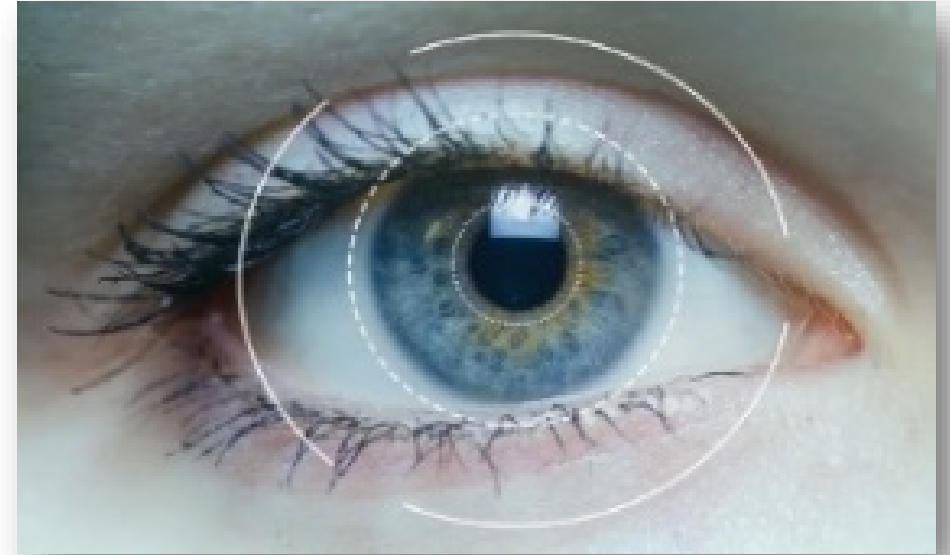
Benefits of Eye Tracking

Foveated Rendering
Better Power management by reducing work loads.

Input Mechanism
Innovative ways for developers to provide gaze inputs in VR

Analytics
Developers can use data like heat map of user's interest for better content creation

Mobile Gaming Update

![Qualcomm Snapdragon logo]

Qualcomm Snapdragon 845 Mobile Platform with Adreno™ 630 GPU offers mobile gamers:

- Rich, console quality interactive experiences

- High fidelity graphics

- Ability to use your smartphone as a game console

- Superior performance in a mobile form factor

Qualcomm created the mobile revolution. See what we're doing for mobile gaming.

netmarble

NetEase Games

Hologrid Monster Battle AR Game

Qualcomm

Thank you

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