



# The Mobile Future of eXtended Reality (XR)

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# XR is the future

Industrial & manufacturing



Engineering



Healthcare



Retail



Education



Marketing & advertising



Military



Emergency response



Entertainment



VR  
XR  
AR

# Will the smartphone become an XR headset?



# XR is here today, but it is still in its infancy

Analogy to smartphones: XR evolution will take years...opportunity will be immense

**Technology Phase:** Infancy

**Market:** Mostly early adopter "Prosumers"

**Technology Phase:** Rapid evolution

**Market:** Surging consumer adoption

XR is here today

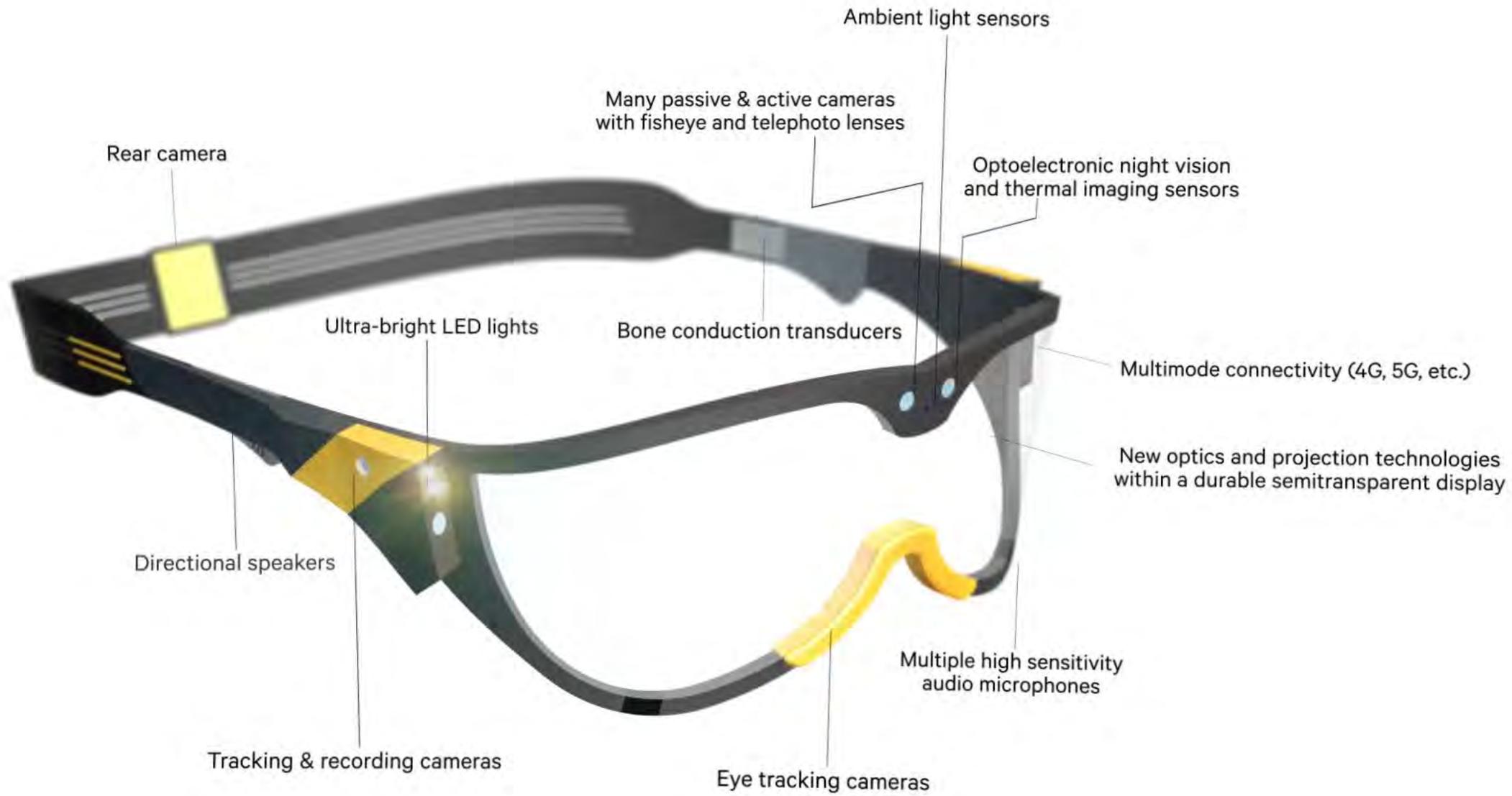
XR by ~2020

**Technology Phase:** Maturity

**Market:** Worldwide, ubiquitous use

XR will follow a similar ~30 year cycle of sleeker designs, with tremendously increasing functionality





# Power and thermal efficiency is essential for XR

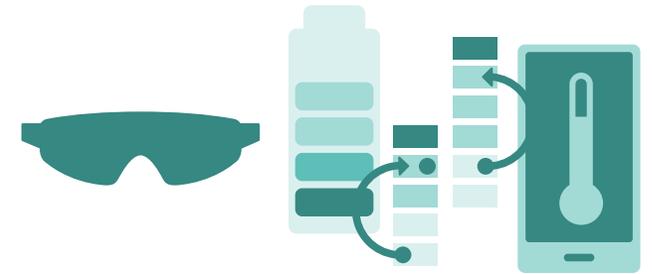
The XR headset needs to be appropriate to wear and use all day



## The challenge of XR workloads

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Very compute intensive  
Complex concurrencies  
Always-on  
Real-time



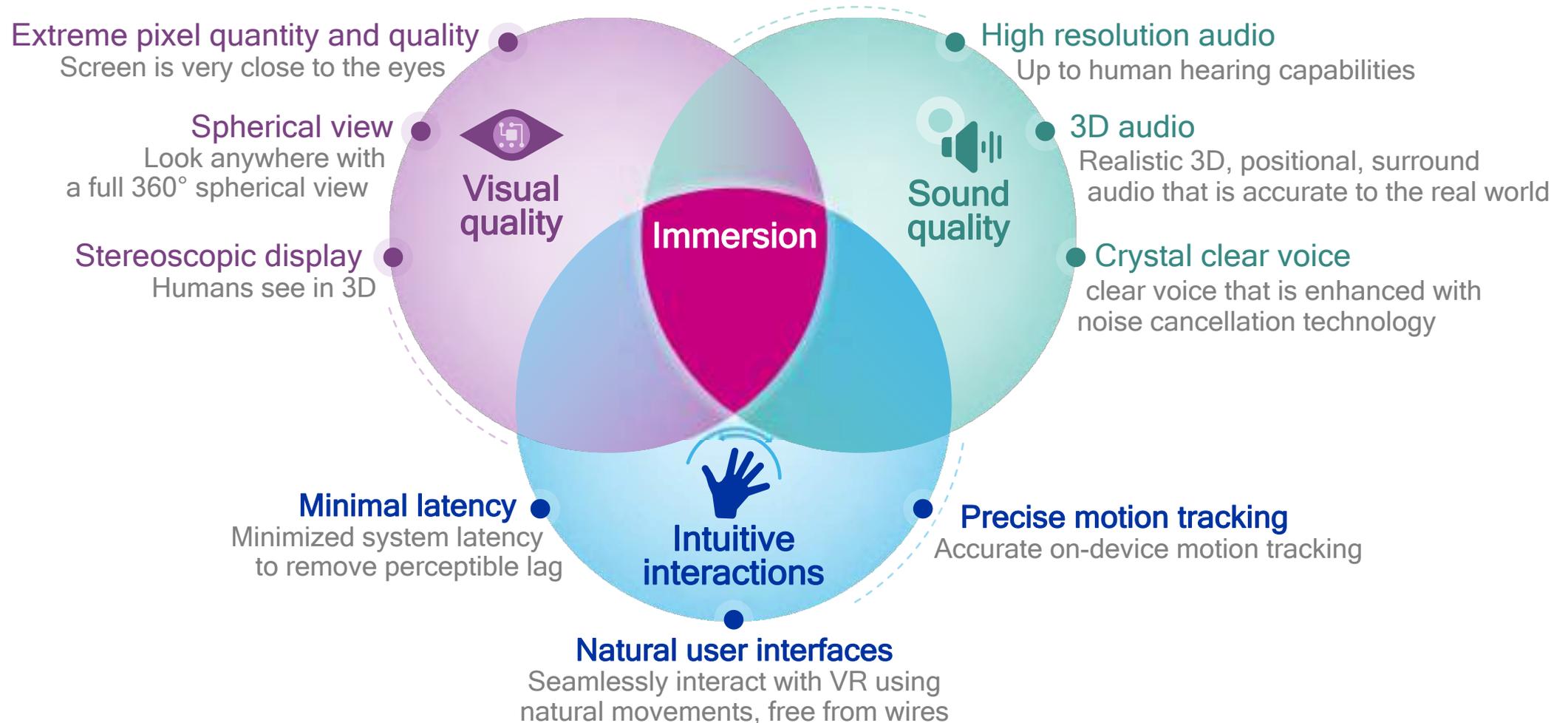
## Constrained mobile, wearable environment

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Must be thermally efficient for sleek, ultra-light designs  
Requires long battery life for all-day use  
Able to be quickly recharged at least 1,000 times

# Immersive virtual reality has extreme requirements

Achieving full immersion at low power to enable a comfortable, sleek form factor





# Immersive visuals with Snapdragon 835

**25%**

faster  
graphics  
rendering

Up to

**60x**

more display  
colors



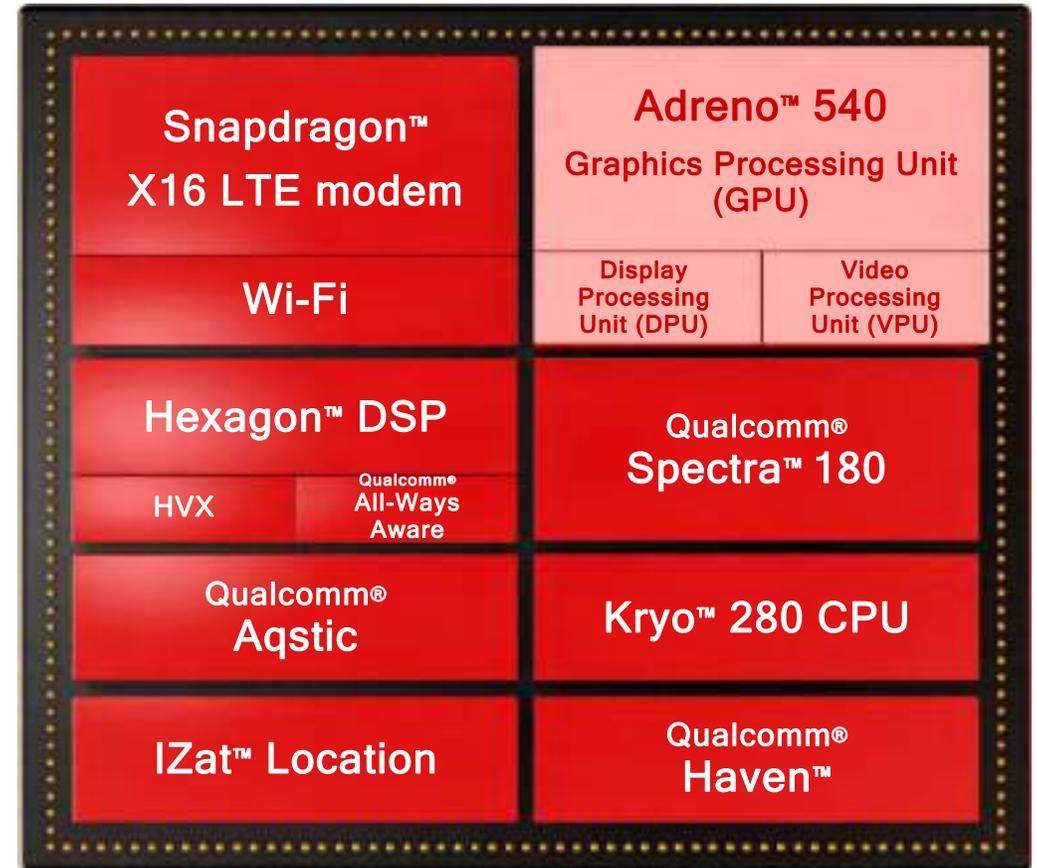
# A heterogeneous computing approach for immersive visuals

Efficient processing by running the appropriate task on the appropriate engine

## Immersive visuals

- **GPU** - Efficient rendering of advanced 3D visuals for DX12, OpenGL ES & Vulkan applications
- **DPU** - 10-bit 4K@60fps display, Q-Sync, and wide color gamut
- **VPU** - 4K HEVC 10-bit playback, foveated video support

## Qualcomm® Snapdragon™ 835



\* Not to scale



# Snapdragon 835 immersive audio experiences



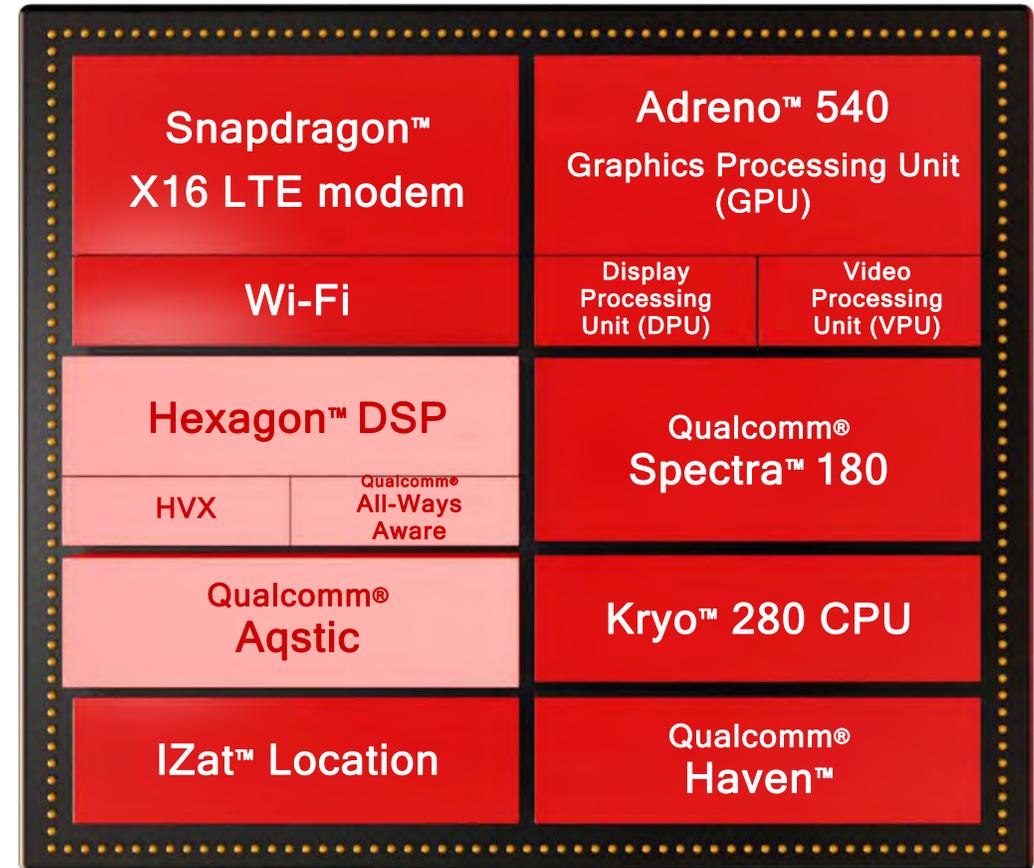
# A heterogeneous computing approach for immersive audio

Efficient processing by running the appropriate task on the appropriate engine

## Heightened sounds

- Support for object and scene-based audio
- Hi-Fi grade DSD format and SNR & THD+N
- Crystal Clear voice

## Qualcomm® Snapdragon™ 835



\* Not to scale



# Computer vision for XR

- 6 DoF head tracking
- Eye tracking
- Hand tracking
- Object detection and recognition



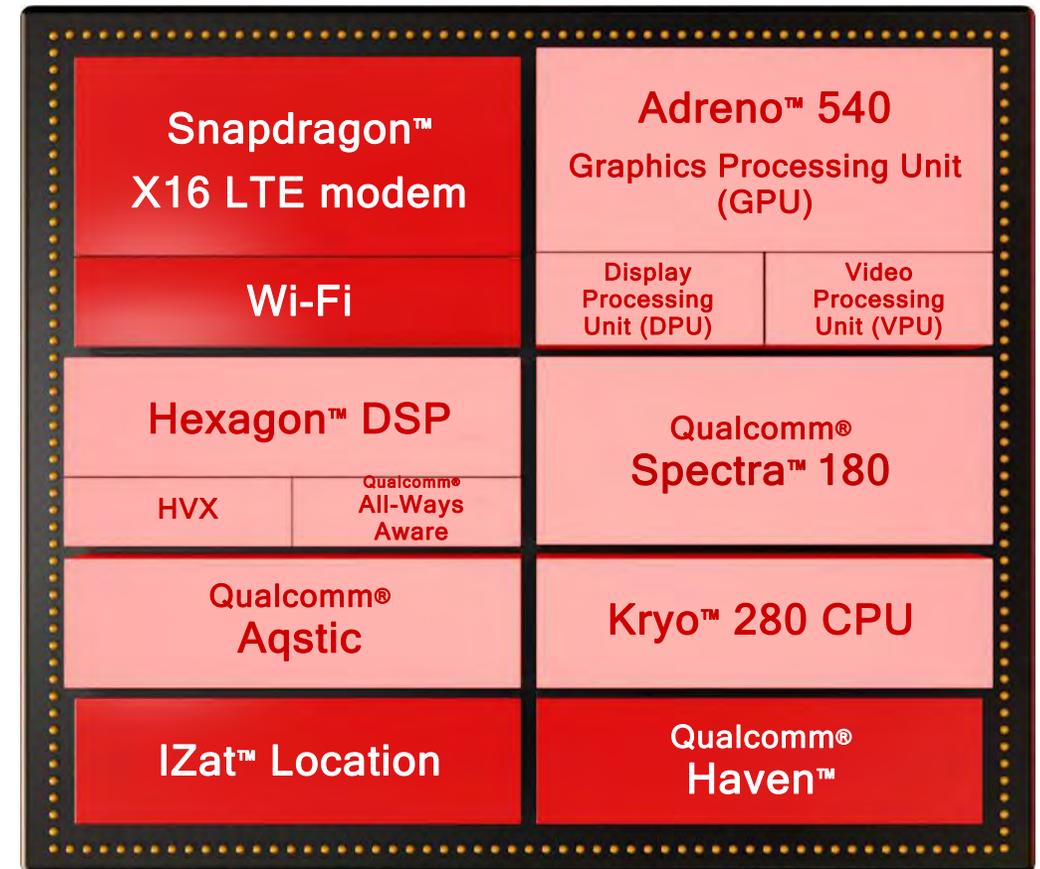
# A heterogeneous computing approach for immersive interactions



Qualcomm® Snapdragon™ 835

## Immersive Interactions

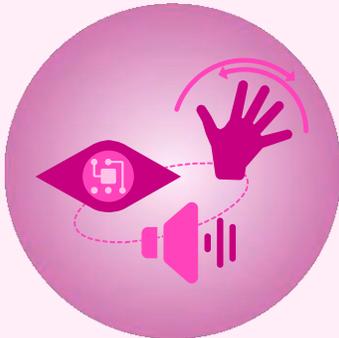
- VIO for precise, low latency 6-DOF
- Computer vision for gesture recognition and eye tracking
- Machine learning for eye movement prediction and gesture recognition
- Hexagon DSP is a crucial differentiator for real-time and low power experiences



\* Not to scale

# AR has additional requirements beyond immersion

Providing an always-on experience that intelligently enhances our lives



## Immersive

The visuals, sounds, and interactions are so realistic that they are true to life



## Cognitive

It understands the real world, learns personal preferences, and provides security & privacy



## Connected

An always-on, low power wearable with fast wireless cloud connectivity anywhere

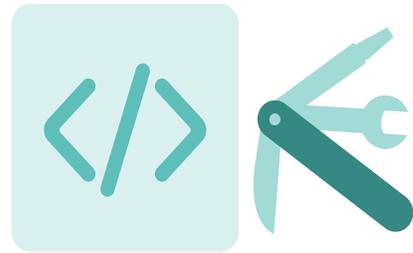
# Significant progress in VR and AR this year

## Improving experiences with Snapdragon 835



### Snapdragon 835

Purpose built silicon for superior mobile VR & AR



### Snapdragon VR SDK

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



### HMD Accelerator Program

Commercialize VR HMDs quickly with fewer resource restraints

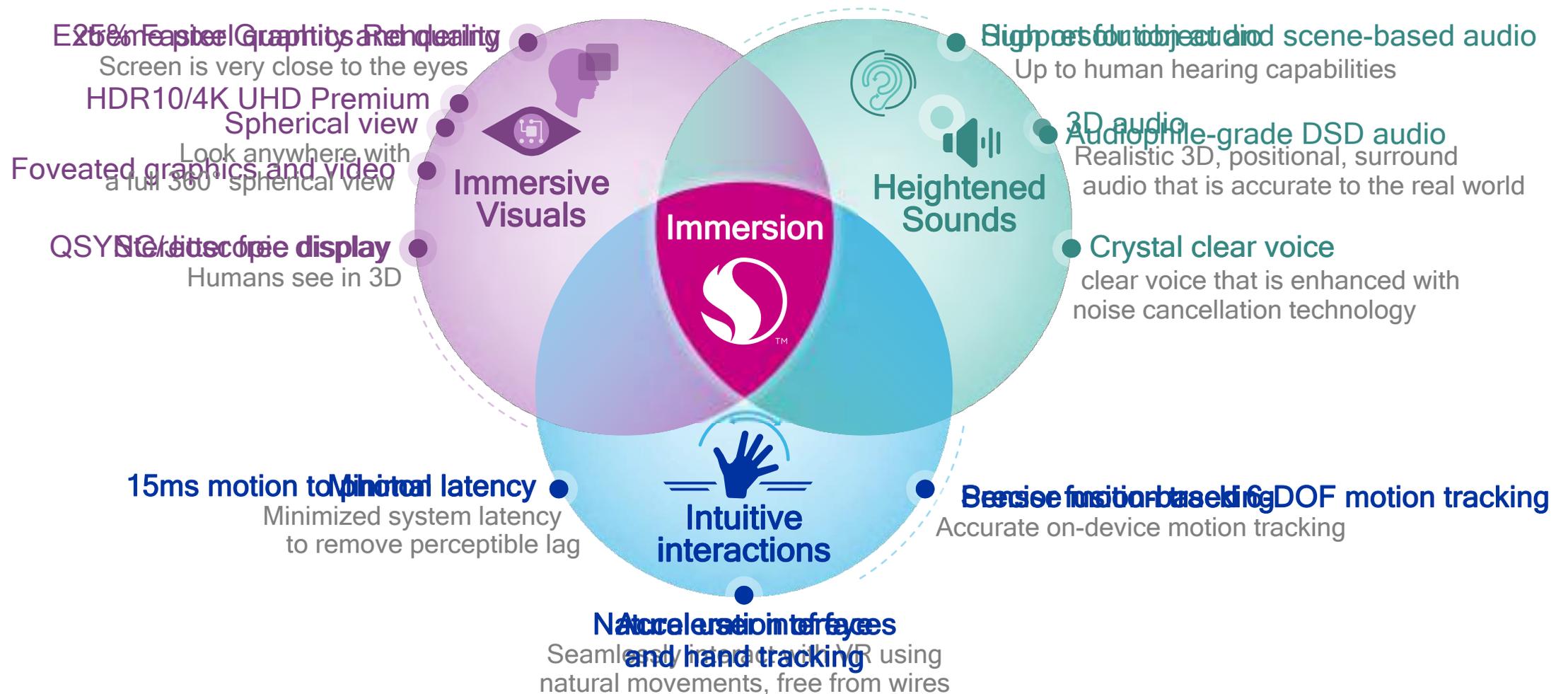


### Ecosystem support

Collaboration with multiple content, technology, and platform companies

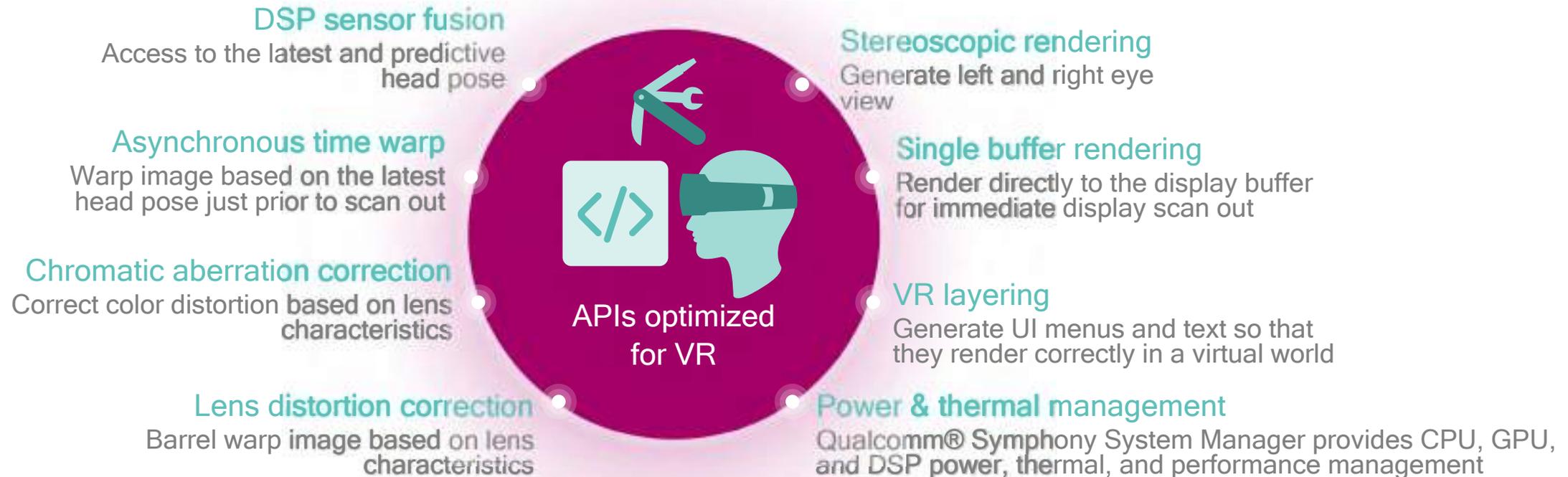
# Snapdragon 835 processor is taking us closer to the vision

Designed to meet the VR processing demands within the thermal and power constraints



# Qualcomm® Snapdragon™ VR SDK

Access to advanced VR features to optimize applications and simplify development



## Benefits

Simplified development

Optimized VR performance

Power and thermal efficiency

# HMD Accelerator Program - Pillars

Commercialize VR HMDs quickly with fewer resource restraints



1

Product  
Reference  
Design



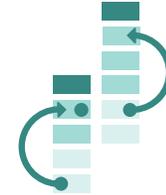
2

ODM  
Partners



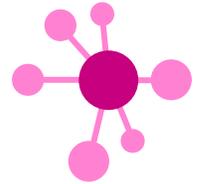
3

Component/  
Peripherals/  
Technology  
Partners



4

Performance  
and Quality  
Metrics/Testing



5

Marketing  
Support

# A comprehensive, robust VR reference design

Reference design based on the Snapdragon 835 SoC



**Snapdragon 835**



## Key components selection

(camera, sensors, display)



## Product/HW Design Files

(schematics, BOM, layout files, thermal design guidelines)



## VR SW Services and SDK

(6DoF, Sensor Fusion, ATW, Single-Buffer Rendering, Unity plug-in, etc.)



## VR HMD Sample Units

(availability in July)

# Accelerating the development of standalone HMDs

HMD Accelerator Program cutting edge components



Sensors



Camera



Controllers



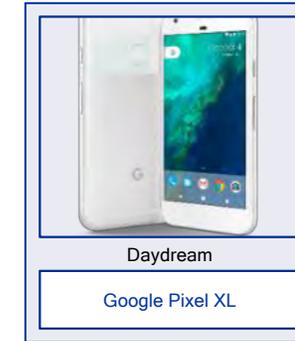
**BOSCH**

Omni  Vision.

**XIMMERSE**

# Actively working with XR device manufacturers

## XR products based on Snapdragon Mobile VR Platform



20+ 20+  
Devices launched In development



# Google Daydream and Qualcomm collaboration

- Jointly fostering the ecosystem of standalone mobile VR
- Google IO accountment: 835 standalone reference design



# Jointly fostering the ecosystem of standalone mobile VR

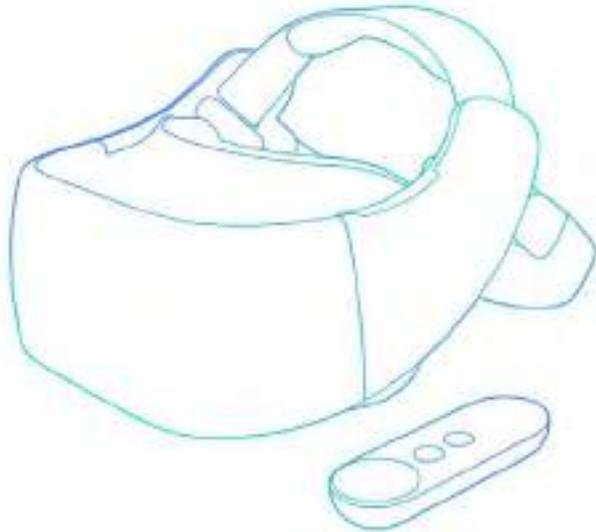


Daydream



QUALCOMM®

htc®



Lenovo™

QUALCOMM® Developer Network

# Snapdragon Mobile VR Development Kit



- ❖ Snapdragon VR SDK
- ❖ Snapdragon VR HMD

[developer.qualcomm.com](http://developer.qualcomm.com)

# Thank you

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