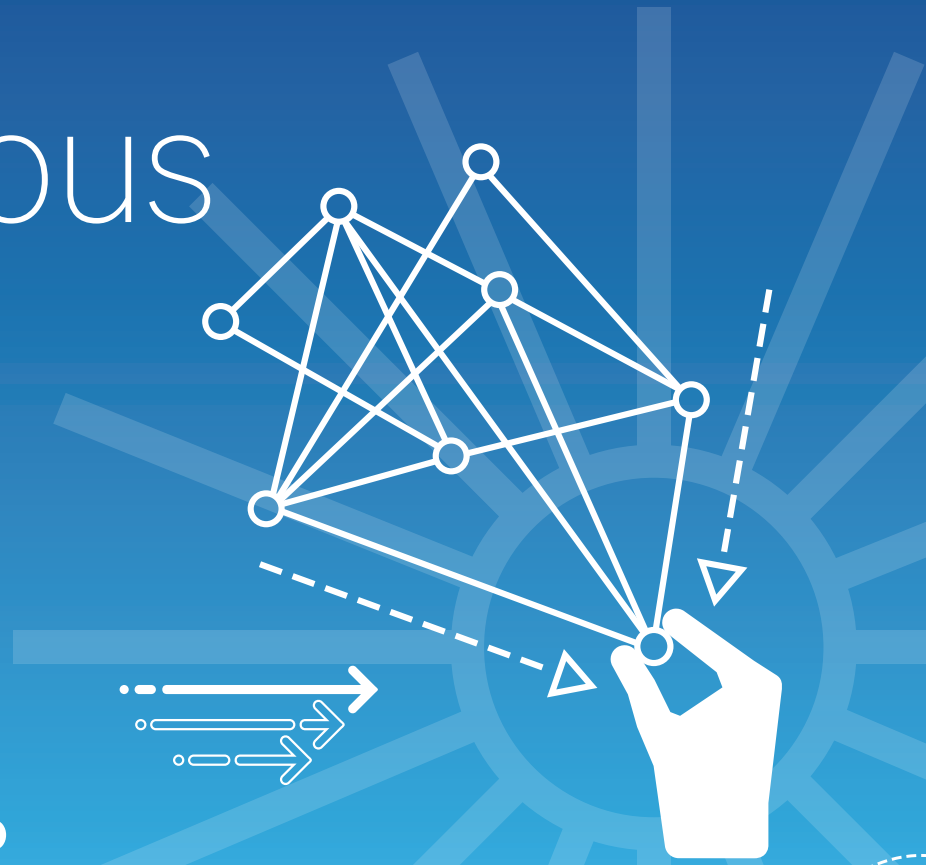
QUALCOMM® Developer Network

Heterogeneous Computing



Learn how you can accelerate app performance and streamline development

Official Technology Partner

QUALCOMM | AMG PETRONAS MOTORSPORT

Embrace diversity for optimum efficiency

A finely tuned Mercedes-AMG Petronas Motorsport Pit Crew, with diverse skills and responsibilities, can change four tires on a car in less than two seconds. It's the perfect application of specialist expertise, targeted with precision for optimum efficiency.

We think of application performance the same way. Using the powerful techniques of heterogeneous computing, developers can accelerate performance by allocating different computational tasks to the most suitable processor.

The *Qualcomm® Snapdragon™ Mobile Platform* includes specialized CPU, GPU and DSP processors, with supporting tools to support optimized application speed, thermal efficiency and battery life.

In this eBook you will learn how you can boost your applications, harnessing the power and flexibility of heterogeneous computing.

1

Use the right tools for the job

While some SoCs employ power-hungry, general-purpose CPU cores to handle workloads, true heterogeneous computing architectures harness the power of specialized processors, maximizing power and performance efficiencies.

The CPU performs the bulk of regular processing work. It's the perfect home for executional logic and general-purpose instructions.

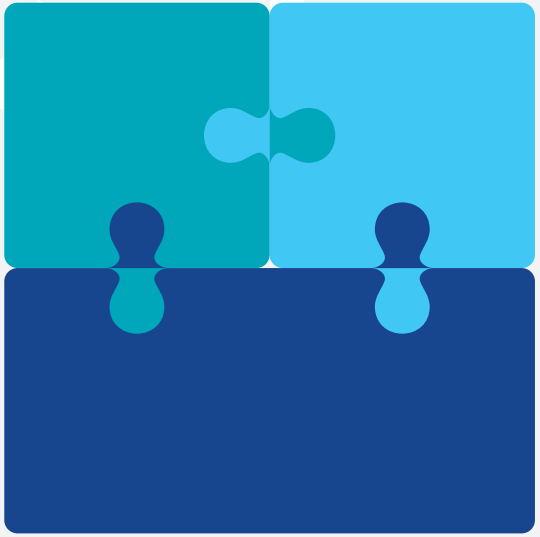
The GPU's parallel architecture excels with complex computations, for example, in machine learning and data analytics. Immersive VR experiences and computer vision applications can also benefit from GPU processing.

The DSP supports high-performance processing of digital signals from the outside world. In cameras, image processing is well suited to the DSP. In drones, it's flight control or in robotics, balance and walking.

Partitioning workload across three powerful processors allows application performance to be greatly improved. ***But how can you balance higher operating performance with low power consumption?***

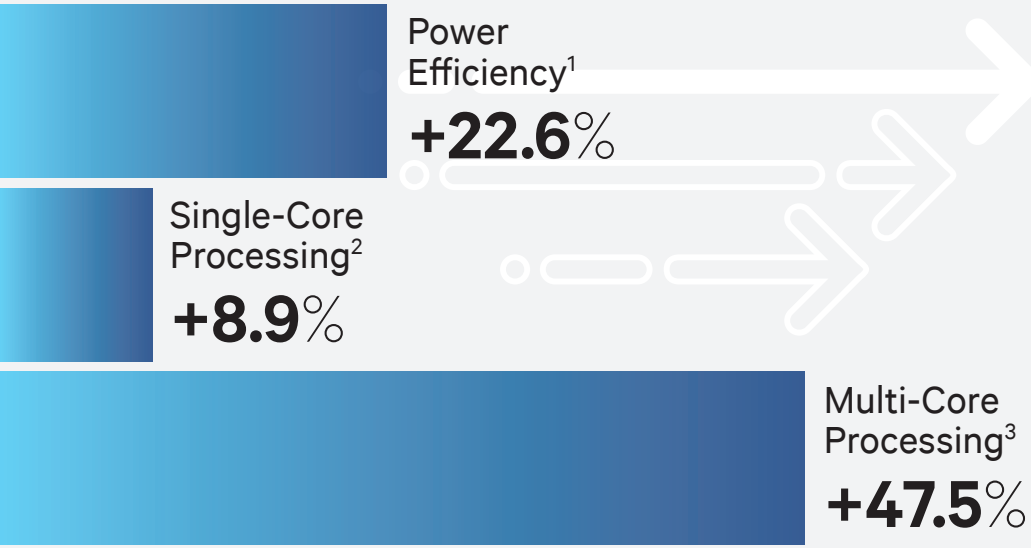
GPU Specialized for producing video and graphics outputs, other computationally heavy output operations (training AI models)

DSP Specialized for ingesting real-time signals; turns voice, video, environmental signals into computationally actionable data



CPU The brain of the SoC; optimized for executing general computational instructions and coordinating between processors

Power & Performance Improvements Snapdragon 835 vs 820



The Snapdragon 835 Mobile Platform is engineered to deliver significantly improved performance and power efficiency over its predecessor.

1 Source: Qualcomm reference device comparison – a device powered by a Snapdragon 820 incurred a power draw of 4.65W under a fixed workload test, compared to 3.56W when powered by the Snapdragon 835. As reported by Anandtech - http://www.anandtech.com/show/11201/qualcomm-snapdragon-835-performance-preview/5

2/3 Source: XDA Developers Benchmark (Geekbench 4) - https://www.xda-developers.com/snapdragon-835-hands-on-and-qualcomm-visit-part-1-benchmarks-performance-power-savings/

Qualcomm Kryo is a product of Qualcomm Technologies, Inc.

2

Optimize thermal efficiency for improved performance

Increasing application demands on mobile processors can result in high operating temperatures, a risk of CPU throttling and poor performance. Balancing operating speed with battery life is essential to delivering the optimal experience users demand today.

The Snapdragon 835 is the first mobile platform to be commercially manufactured using the 10nm FinFET process, designed to combine high performance with low power consumption.

The platform includes the Qualcomm® Kryo™ 280 CPU, built on a big.LITTLE architecture comprising four “performance” cores and four lower-power “efficiency” cores.

This innovative design can help developers to build compute-intensive applications that stretch the capabilities of mobile technology, while adhering to rigorous thermal limitations.

See how developers in areas like ***computational photography*** and ***virtual reality*** are already creating powerful new mobile experiences optimized with the support of heterogeneous computing.

3

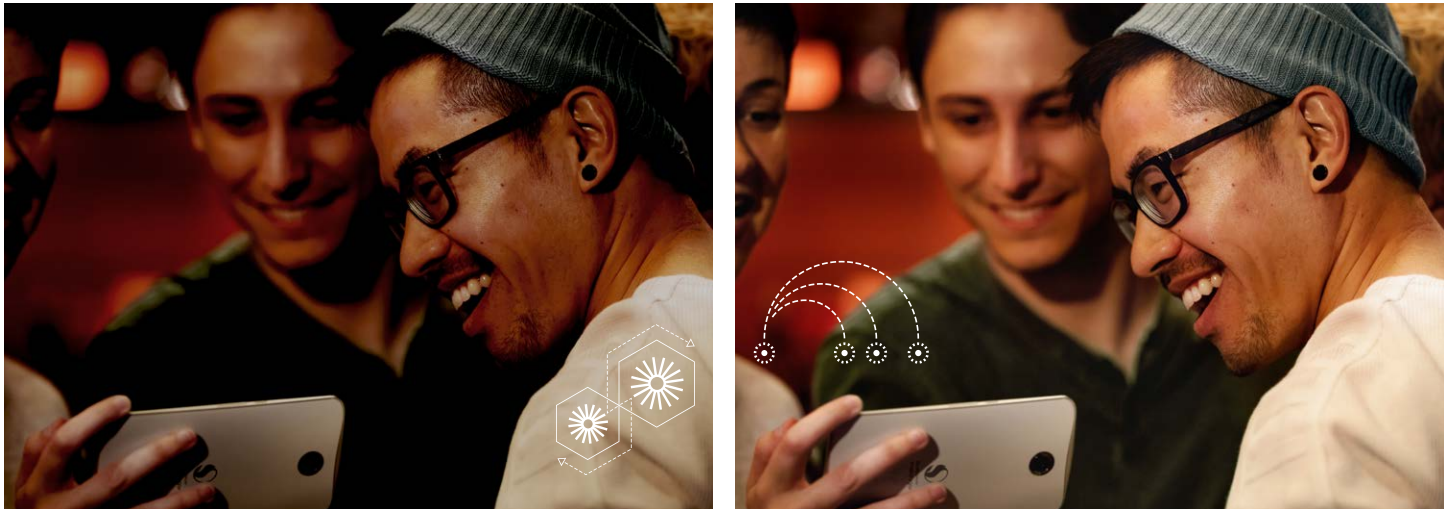
Create enhanced, intelligent sensory applications

While the DSP has supported popular mobile features for many years—audio, fitness and GPS tracking to name just a few—developers are now leveraging its strengths to deliver next-generation sensory experiences through image processing.

Computer vision research is underpinning 3D object detection and recognition, powering applications in location mapping, augmented reality and indoor navigation.

Meanwhile, mobile imaging is being transformed through *computational photography* algorithms, supporting features like electronic image stabilization, seamlessly-bridged optical/digital zoom and advanced HDR+ processing.

Moving tasks from the CPU to the DSP supports the delivery of tomorrow's intelligent and immersive user experiences with minimal power consumption.



A low light video (left) enhanced with real-time processing via the Qualcomm® Hexagon™ DSP

Qualcomm Hexagon is a product of Qualcomm Technologies, Inc.

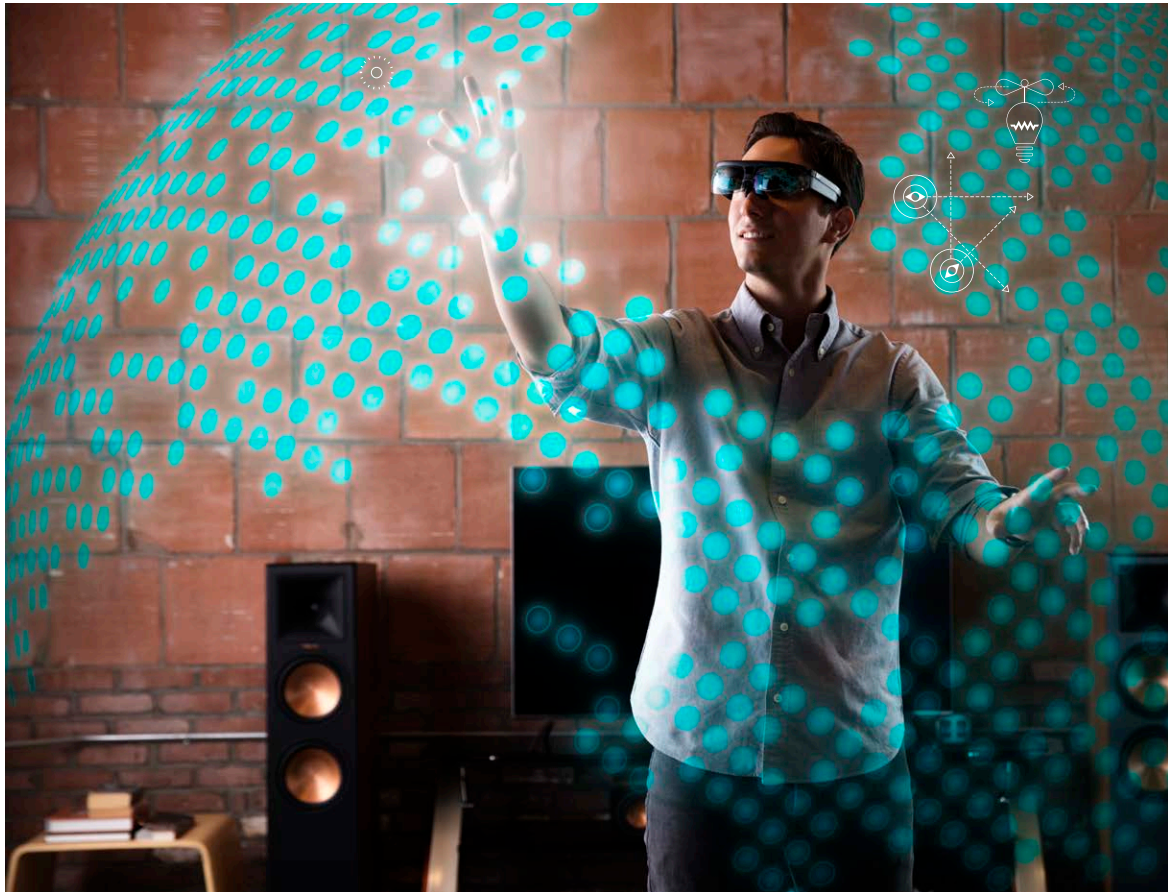
4

Build responsive, immersive user experiences

Heterogeneous computing platforms are ideally suited to creating immersive, mobile *virtual reality* experiences. Together, the diverse features of the CPU, GPU and DSP power advanced motion tracking and stable framerates in wireless, passively-cooled, head-mounted displays.

High quality 3D audio immerses the user in the virtual world, delivering accurately mapped 360 surround sound. Noise cancellation and speech recognition further enhance the experience, supporting crystal clear voice control and chat. Essential elements, weaved together to make the virtual feel real.

The *Qualcomm® Snapdragon™ VR SDK* can help developers achieve improved efficiency in devices built with the Snapdragon 835 mobile platform. Architectural advances are engineered to provide control of the VR processing pipeline, along with cohesive power and performance management.



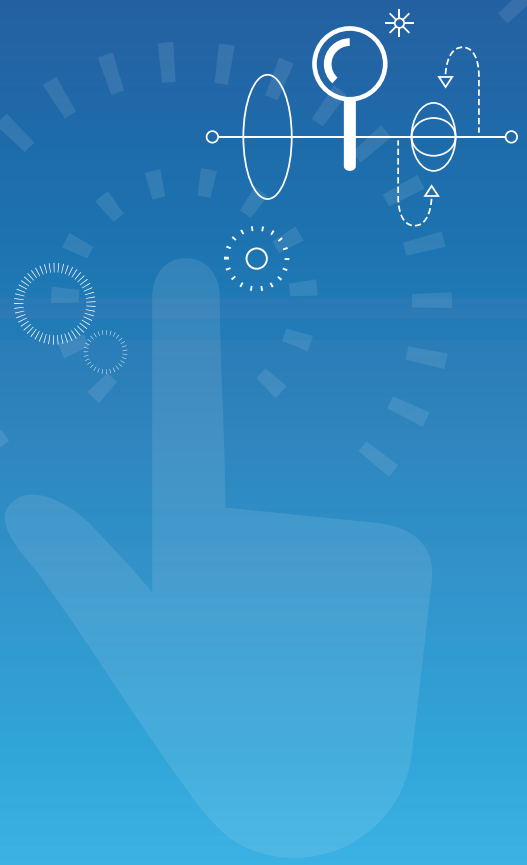
Qualcomm Snapdragon VR SDK is a product of Qualcomm Technologies, Inc.

Innovate together

Heterogeneous computing can help developers stay ahead of the curve, transforming great ideas into world-class applications.

Visit *Qualcomm Developer Network* to explore tools and resources that will inspire you to get the most out of heterogeneous computing-ready mobile platforms like the Snapdragon 835.

Qualcomm Developer Network is a collection of software and hardware tools, inspiring our community of developers to push the boundaries of mobile. We're continuously creating some of the most innovative, powerful and disruptive technologies in the world, and Qualcomm Developer Network is the gateway through which you can discover the tools you need, whether you're building high-performance apps, smart Internet of Things (IoT) devices, immersive virtual reality experiences or for other emerging technologies.



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