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Qualcomm Details Snapdragon 835: Kryo 280 CPU, Adreno 540 GPU, X16 LTE

by [Matt Humrick](#) on January 3, 2017 5:00 PM EST

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INTRODUCTION



Qualcomm previously revealed the name of its new high-end SoC, but today at CES 2017 it discussed the Snapdragon 835 in greater detail. Replacing the Snapdragon 820/821 as the pinnacle processor in its lineup, the 835 is the first commercial SoC to use [Samsung's 10nm "10LPE" FinFET manufacturing node](#). Qualcomm did not disclose die size, but it said the overall package size is 35% smaller than the Snapdragon 820 and contains more than 3 billion transistors. Samsung says its third-generation FinFET node "allows up to a 30% increase in area efficiency with 27% higher performance or up to 40% lower power consumption" relative to its first-generation 14nm 14LPE node at the same frequency, so Snapdragon 835's process advantage over the 820, which uses Samsung's second-generation 14LPP node, will be a bit less.

In addition to smartphones and tablets, Qualcomm sees the 835 powering IP cameras, VR and AR head-mounted displays (it has a reference HMD design available for partners and says several products are currently in development), and even [new ultra-portable cellular PC devices with full Windows 10 support](#). This includes both Universal Windows Platform (UWP) apps, which run natively, and legacy x86 (32-bit) Win32 apps, which use software emulation. These new PC devices should also support any peripherals already supported by Windows 10 and eSIM support for cellular connectivity.

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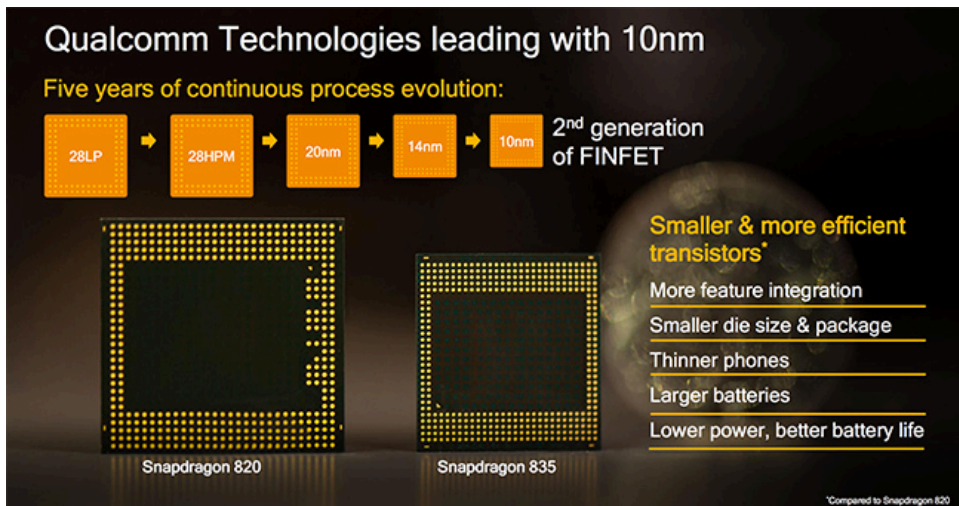
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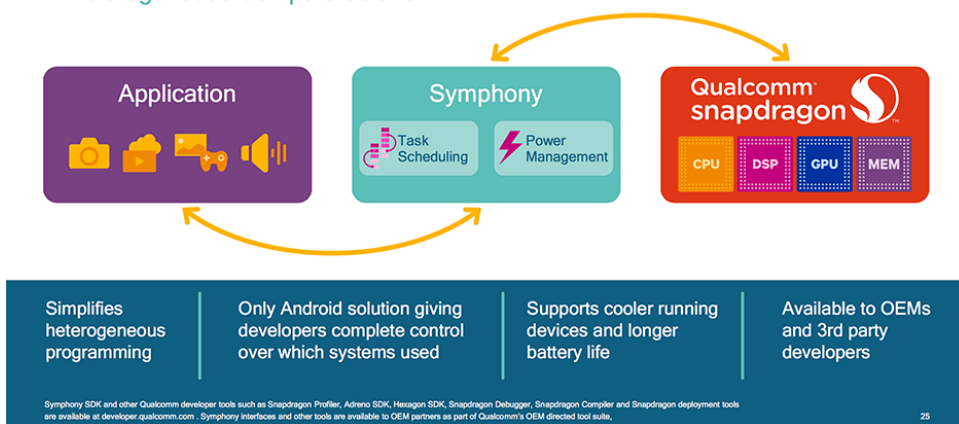


Qualcomm finds itself in a much different position today compared to one year ago when it launched the Snapdragon 820. Back then, it was on the hot seat after its previous flagship products, the Snapdragon 808 and 810, failed to meet expectations. Qualcomm's implementation of ARM's Cortex-A57 CPU core and TSMC's last 20nm planar process were not a good combination, resulting in a generation of flagship phones that struggled to meet or exceed the performance of older models and exhibited higher than normal skin temperatures. The success of Snapdragon 820 would be crucial to regaining its partner's trust and restoring its image with consumers.

The 820 was pivotal for another reason too: It introduced Qualcomm's first custom 64-bit CPU core, Kryo. Creating a custom CPU (or GPU/DSP/ISP) is one way for SoC vendors to differentiate their products and establish themselves as innovators. Snapdragon 810's use of stock ARM cores could be construed as a step backwards then after previous Snapdragon SoCs used Qualcomm's custom Krait CPUs. Apple's prior introduction of a custom 64-bit CPU, which caught everyone by surprise, only added fuel to the fire.

The Snapdragon 820 would go on to become a commercial success with many design wins. It powers the majority of flagship phones released over the past year, and while Kryo trails ARM's A72 and Samsung's M1 CPUs in IPC, it performs well enough to deliver a solid user experience.

Tight integration into Symphony System Manager A Heterogeneous Compute Solution



With today's launch of Snapdragon 835, Qualcomm looks to build on the 820's success and its vision for the future: heterogeneous computing. By combining the unique abilities of each processor type—CPU, GPU, and DSP—Qualcomm hopes to bring new features and experiences, such as VR and machine learning, to mobile devices.

The 820 introduced several key features that form the foundation of this vision, which is why it's so important to our discussion of the 835. Its Hexagon 680 DSP added single instruction, multiple data (SIMD) Hexagon Vector Extensions (HVX) specifically aimed at accelerating the aforementioned VR and machine learning workloads, along with more efficient processing of photography and computer vision tasks. The Adreno 530 GPU's compute capabilities received a boost too, and the GPU and CPU gained the ability to snoop into the other's cache using shared 64-bit virtual memory addressing, enabling better sharing of data. Qualcomm also introduced its Symphony System Manager alongside the 820 to provide task scheduling and power management for the various processor cores.

TWEETS



RyanSmithAT: First year NVIDIA has had the opening keynote slot. Should prove interesting <https://t.co/8oeZ67K5mW>

ganeshts: @jeffkibuule @Flatpanels @robertheron then you need new TVs and receivers. 48 Gbps is a heck of an increase to be done without new silicon

ganeshts: @jeffkibuule @Flatpanels @robertheron you need new wires.

ganeshts: @danluu Hard to get writers who really understand the industry, when ROI (from time / effort perspective) is minimal without linkbaiting

IanCutress: @A_Thiol Will move to new benchmarks in Feb - Civ 6, ROTR, AOTS, Rocket League, GTA V. Will automate, get the results that make sense :)

IanCutress: @A_Thiol Min vs 99% - when you get that odd run which has a 200ms frame, or 20ms when average is 18.5ms, how to know. 99% is better

IanCutress: @JarthalIT Plan for part 2; just configed an OS image, need to adapt script for Win10 trickery

IanCutress: @A_Thiol While that's a number from the benchmark, it's still a bit iffy. Benchmark update in '17 will aim for frame rate analysis

IanCutress: @FPiednoel wait, I just left the same restaurant

RyanSmithAT: RT @anandtech: Qualcomm Details Snapdragon 835: Kryo 280 CPU, Adreno 540 GPU, X16 LTE <https://t.co/KpgCqykB2d>

ganeshts: @Dresdenboy @FPiednoel and the price! The original analogy is not very apt for a Twitter discussion :)

RyanSmithAT: @jibberegg Looks like it's ad related. Unfortunately I can't tell you more than that from CES, but I'll poke someone

RyanSmithAT: RT @anandtech: AMD Announces FreeSync 2: Easier & Lower Latency HDR Gaming <https://t.co/f9jNSXPkyn>

RyanSmithAT: @ChrisCarty_ Yes. CES just got in the way

ganeshts: @chippy Use JDownloader (free and open source) in a VM. Also gives full control over what one needs from a YouTube link

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Snapdragon 835 processor

Snapdragon X16 LTE
World's first announced gigabit-class LTE modem

Qualcomm® Hexagon™ DSP
Tensorflow and Hallide Support

Qualcomm® Kryo™ 280 CPU
Our most power efficient architecture to date



Qualcomm® Adreno™ Visual Processing
25% Faster Graphics Rendering
60x More Display Colors*

Qualcomm Spectra™ Camera ISP
Smooth Zoom
Fast-Autofocus
True to Life Colors

Qualcomm Haven™ Security
First to support full biometric suite

* Compared to Snapdragon 820
Qualcomm Adreno, Qualcomm Kryo, Qualcomm Hexagon, Qualcomm Spectra, Qualcomm Aqstic, Qualcomm IZat, and Qualcomm Haven are products of Qualcomm Technologies, Inc. 6

The Snapdragon 835 is more evolutionary than revolutionary by comparison. Every block within the new SoC receives an update, however, enabling new features and claims of higher performance and better battery life. With the backstory complete, it's time to discuss these changes in more detail, starting with the biggest change of all: the CPU.

INSIDE THE SNAPDRAGON 835: CPU, GPU, DSP, ISP

INTRODUCTION

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ddriver - Tuesday, January 03, 2017 - link
"Thinner phones" - please don't. I'd rather have double the battery life. We've long passed the point of reasonable thinness.

REPLY

Peskarik - Wednesday, January 04, 2017 - link
I know, right? The frigging things are so thin already one has to buy an ugly protective shell to be able to hold them properly!

REPLY

bug77 - Wednesday, January 04, 2017 - link
After all the videos of phones bending, videos of people cutting their fingers on phone's edges are only an evolutionary step :D

REPLY

WorldWithoutMadness - Wednesday, January 04, 2017 - link
evolutionary step... heh, more like devolution.
If only people who bought the phones get to vote what features should be in the next generation of that phone, maybe we wouldn't be in this madness.

REPLY

TheinsanegamerN - Wednesday, January 04, 2017 - link
you vote with your wallet.

People keep buying the thinnest one, because your average consumer only cares about fashion accessories, and not having a useful tool.

Its about time we kickstarted our own brand of phone.

REPLY

Omega215D - Wednesday, January 04, 2017 - link
I already did by buying the Moto Z Force over the Moto Z or iPhone 7. If I can't grip the phone comfortably without a case or attachment then it's a no go. It also needs to house a 3000mAH or larger battery.

[REPLY](#)

[WorldWithoutMadness](#) - Wednesday, January 04, 2017 - link

That's just like America voting all over again :D.

Kickstart? Heh, if I'm not mistaken, everything failed to even make a dent.
For me, the moment google had to sell Motorola is the start of the downfall of a good trend (battery-performance-style-size) and motorola under lenovo just don't have that google chemistry anymore, looking at thinkpad series.... far from its legendary history.

[REPLY](#)

[prisonerX](#) - Wednesday, January 04, 2017 - link

Yeah, unfortunately the market disagrees with you and other whiners of your ilk.

Go buy a phone with a removable battery and you can have as many multiples of battery life as you're willing to carry.

[REPLY](#)

[negusp](#) - Wednesday, January 04, 2017 - link

How can it disagree with us when there aren't any mainstream flagship phones with removable batteries/large batteries?

Besides, nobody wants to carry a bunch of replacement batteries. It's not that hard to throw an extra 2mm in and have a ~4000-5000 mAh battery.

[REPLY](#)

[prisonerX](#) - Wednesday, January 04, 2017 - link

Open your eyes and you shall see: http://www.gsmarena.com/lg_v20-8238.php

No, no-one wants to carry a fat phone, that's why phones aren't getting fatter with substantially larger batteries. What don't seem to be able to understand is most people are happy with battery performance.

Yeah, 4000-5000 is the magical number, if only phones had that no-one would run out of power, right? No one wants to carry around extra batteries but they want to carry around external battery pack chargers, right? You've really thought this through, haven't you?

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