Qualcomm AI Strategy Springs From Mobile

QUALCOMM TECHNOLOGY ENVISIONS THE EMERGENCE OF A POWERFUL INNOVATION SPIRAL.

Most consumers have no idea that every photo they take with their smartphone uses Artificial Intelligence (AI) to improve photo quality, or that every time they speak to their phone, an AI in the cloud is used to understand the message. And that transparency of AI within common applications and features is important: ubiquitous AI will seamlessly improve just about every application we use on a handset, a factory floor, a surgical theater, or a workplace.

Qualcomm Technologies, Inc. (QTI), has been evolving power-efficient AI on the Snapdragon mobile processor for nearly a decade and has recently produced record performance/watt based on the Cloud AI100 server running the MLPerf benchmark suite. But beyond fast chips and software, the company is driving the democratization of pervasive AI, leveraging an innovation spiral that starts in handheld devices and then spreads to the data center with their industry-leading 5G technology, all enabled by a rich ecosystem of application developers. Qualcomm calls this approach Distributed Intelligence.

A VIRTUOUS CYCLE OF INNOVATION

QTI embeds AI in both applications, such as computational photography and accurate voice interaction, as well as in the operation of the mobile handset itself, optimizing 5G to extend the network's reach, and power management to prolong battery life. This platform then provides powerful hardware and software that application developers use to develop smart applications, some of which require additional processing power available in the cloud over
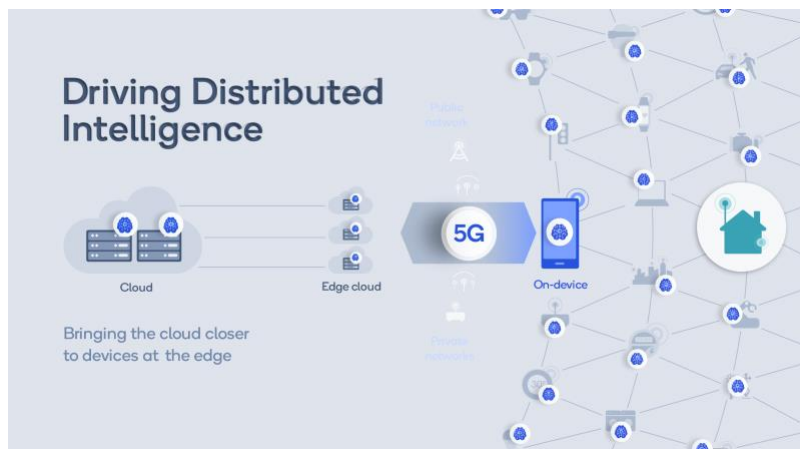
5G or WIFI. But as we all know, the transfer of data to the cloud for analysis and the round trip return of the desired answer can be problematic, especially in areas of limited connectivity. So, the application innovation drives additional requirements back to the handset maker and the SoC developer (QTI) for improved on-device functionality and performance. This virtuous loop of Mobile AI & 5G ➔ Smart applications ➔ Distributed intelligence ➔ New AI Tech can give QTI's customers a competitive advantage in the marketplace.

SMART APPLICATIONS, ENABLED BY FAST AI HARDWARE

The innovation spiral originates with fast on-device AI processing. QTI is now shipping the 6th generation AI Engine on the Snapdragon 888 5G Mobile Platform. The result of a decade of research, these newest platforms deliver over 25 times the AI performance of the original Snapdragon. When coupled with fast 5G networking, these engines can offload heavy-duty tasks to the edge cloud, where the Qualcomm Cloud AI100 can efficiently supplement the on-device capabilities.

Some example benefits include on-device spoken language translation, a feat that required significant cloud processing until just recently. Armed with this capability, people of different cultures and languages can come together and have real-time conversations, each participant speaking in

their native tongue.

Another example is the use of on-device AI to directly understand what the device is seeing or hearing in an image or a frame, and take appropriate action based on complex analyses. For example, in a smart city or smart venue surveillance operation, an array of hundreds or thousands of cameras can independently notify authorities of an anomaly for further assessment of the potential threat to health and safety, without monitoring each camera. Another example is using on-device AI to solve choppy transitions between multiple cameras while recording a video. Qualcomm has worked with Arcsoft to enable their smooth zoom algorithm on the 6th gen AI Engine. Note that the Qualcomm AI Engine has the ability to run multiple neural networks simultaneously, while running the smooth zoom neural networks. In addition, it can also run Arcsoft's AutoZoom feature, which keeps the subject that you are shooting in the frame automatically even if you switch cameras between ultra-wide and telephoto. You have to see this feature in action to fully appreciate it.

A critical enabler of on-device AI is the availability of an extremely low-energy Sensing Hub available on the Snapdragon 888, where always-on sensors can trigger smart actions based on not only the existence of an input signal but on the understanding of the nature of that signal. Knowing that a 50db noise is a shattered window in the middle of the night can immediately notify the homeowner and authorities, saving precious seconds in implementing a response.

AI IS BECOMING PERVASIVE

Distributed Intelligence will integrate new applications on the edge and cloud. And QTI is bringing its core mobile AI technology to new frontiers, including IoT, Automotive, Always Connected PCs leveraging the same AI technology. For example, in the automotive area, QTI is expanding its Autonomy and Advanced Driver Assistance (ADAS) allowing for a safer and more overall sustained system performance powered by AI. IoT products from Qualcomm are expanding with additional AI features as well, where a myriad of sensors/camera available today allow for data collected at the edge to be processed either locally or in the cloud as needed. The Qualcomm-based SQ1 processor-powered Microsoft Surface Pro X has a unique AI-powered feature called "Eye Contact" that runs on the Qualcomm AI Engine to make sure you always appear to be making eye contact with the camera at high frame rate while sipping very low power. This is an exclusive feature that traditional X86-basesd CPUs won't be able to run due to lacking a dedicated AI processor to enable this kind of AI algorithm at high frame rate and low power.

CONCLUSIONS

Qualcomm is one of the few if not only semiconductor companies to offer AI engines in both SoCs for mobile and edge processing and in close-to-the-edge cloud servers. With over a decade of experience with mobile and now data center AI, the company is in a unique position to build the future:

1. High-performance AI Engines that support ubiquitous applications and smart features on consumer mobile platforms.
2. An ecosystem of development software and partners that exploit the AI engines to come up with valuable new applications for AI models.
3. A power-efficient server platform that leverages the mobile technology and application stack to provide high-performance cloud services.
4. A technology roadmap that powers ever-more on-device and cloud AI performance.

We believe that this comprehensive strategy coupled with leadership performance and power efficiency will position Qualcomm well for significant growth in AI.