Power Optimization in Mobile Chipset

Introduction

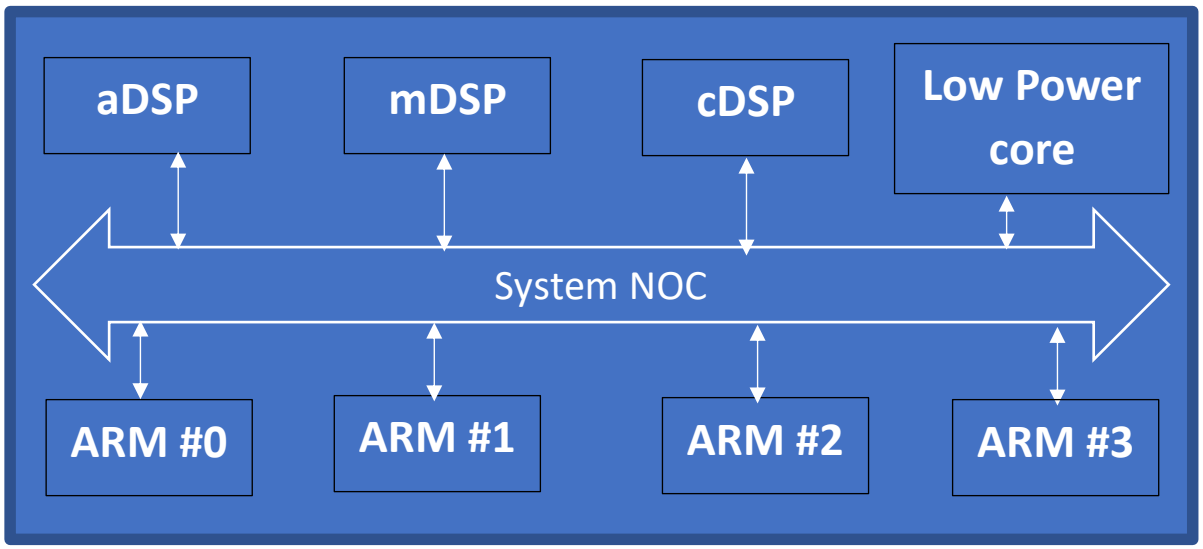
Mobile hardware mainly consists of DSP, CPU (ARM processor) and memory (RAM). Processor used are subject to design metrics that emphasize cost, time-to-market, and low-power. Advanced architectures may include multiple DSP's or hardware coprocessors.

Current Consumption

When a mobile is charged 100%, and is left unused it typically lasts 200+ hrs. This is the idle state power consumption behavior as the CPU spends hardly any cycles doing work. When a particular application is started, the associated software or program is loaded onto main memory and executes till completion. An execution of a program is termed as process. The CPU gets into active mode and work is done by the CPU. If the CPU takes N processor cycles before the process is exited, the current consumed is directly proportional to the number of processor cycles taken by the process. Hence each process consumes current and drains the battery by certain amount. The sum total of all the current consumed by the various process thus determines the battery longevity of the mobile handset.

Power optimization

The entire software stack of the mobile phone is run on dedicated processors in the SoC. The communication and connectivity software (LTE) are typically run on a Modem DSP (mDSP). The compute intensive video applications are run on compute DSP (cDSP), the low power Audio solution on Audio subsystem (aDSP), and many of the apps are run on Application processor (ARM cores).



Block Diagram of Snapdragon SoC

The power consumed by each software on their respective cores have to be ideal in the sense that they need to be optimized harnessing maximum support of the ISA of the core. What we attempt is to study, propose and implement the best way the software can be implemented on the cores ARM / DSP. We identify the most frequently used Apps or software component and critical ones, and leverage last mile of optimization thus achieving power optimization from a per program/software per core perspective.

Talk Time Improvement

Talk time power measurements indicate battery longevity of about 15-20 hours on most phones. We have demonstrated an improvement of 4x performance improvement by this approach. We further investigated the problem by moving the vocoder software stack onto one of the relatively underutilized ARM cores in the SoC, and were able to get another 4x performance boost. That is, talk time increased by 8x by mere software re-architecture and upgrades.

Packaging

The offerings can be bundled together along with new audio features such as 3-D Home theatre app hosted on LPASS for a new platform tape out and hence new handset model in the market. We expect the branding of this handset model to be better than their counterparts. Not only that, we can pick a suitable version of Snapdragon platform for low cost implementation of the targeted power performance levels.