big.Little Architecture

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Agenda

- Background on the why big.Little was created
- How it works
  - Hardware
  - Software
- Summary on the A7 and the A15
- Performance Improvements
- Future Improvements

Background

- Increase in performance and hardware of phones caused damper on battery performance
- Rise in idea of smartphones being an all in one device
- The demand for high performance and battery longevity grew as smartphone capabilities increased
- big.LITTLE architecture was one of the solutions

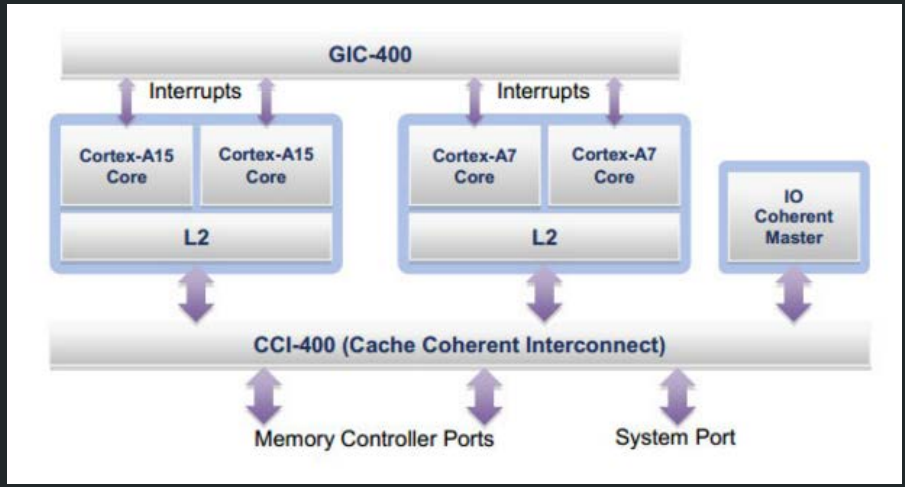
Cell Phone comparison

Then:

Now:

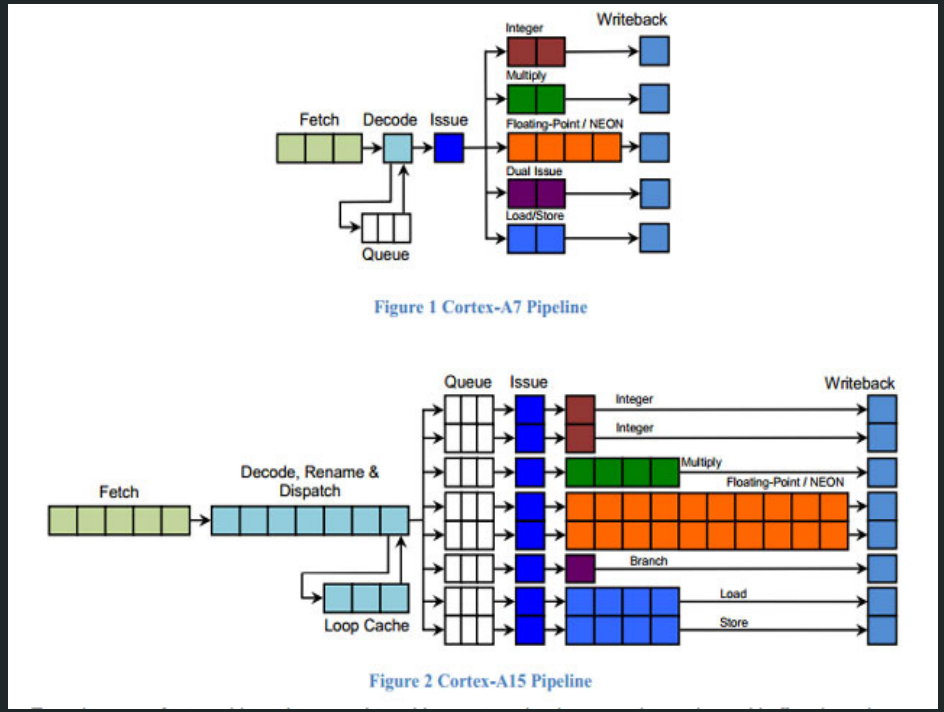
How it works - Hardware

- Each CPU has separate cache with access to main memory.
- This allows the cores to be “hot-swappable”
- Arm says that it takes about 20,000 cycles to switch from one to another.
- That is a lot of time in computing, but not a long time for a user to notice.



Talk about A7 and A15

- The A7 Processor has significantly less resources than the A15 processor
- The A15 Processor is designed to be a much more powerful processor but it is also designed to draw more power
- The A7 processor is designed to be a very power efficient processor that does not use much resources



How it works - Software

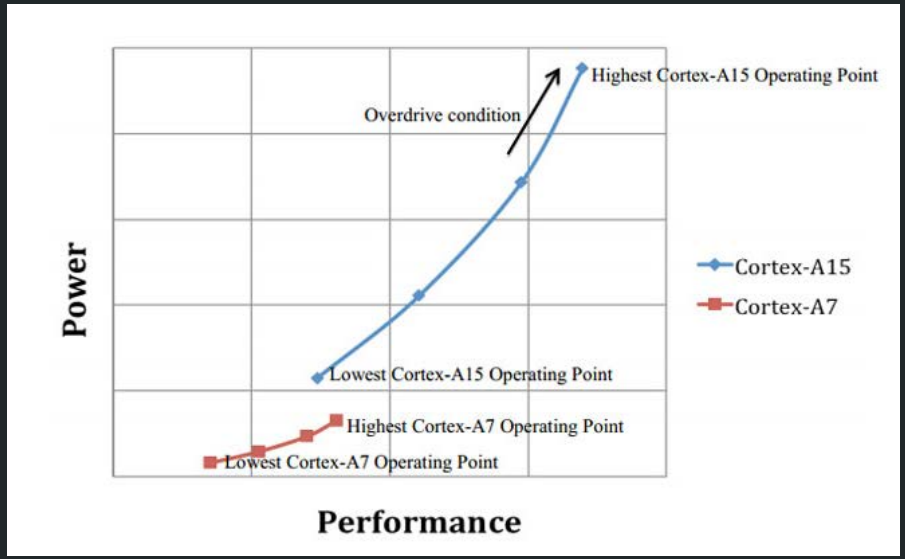
Clustered Switching - switching from the “big” or the LITTLE clusters. Only one cluster can be active at one time.

In-Kernal switcher- pairing the big and LITTLE core as one virtual core. The OS chooses which physical core is active and most efficient without the app knowing. Again only one core active at a time.

Heterogeneous multi-processing- All physical cores are active and contributing. This could be very useful for large computation tasks but it is not power efficient.

Performance Improvements

- The Arm has found that many tasks can easily be handled by a tiny low power core.
- Only very intensive tasks require the stronger A15 processor to be enabled
- Arm has measured over 50% in energy savings for popular activities such as web browsing and music playback.



Future Improvements

- Currently the Cortex-A7 is one of the more power efficient microprocessors and the Cortex-A15 is one of the more powerful.
- In the future, we would expect ARM to incorporate this big.LITTLE Idea with its new processor designs.

Summary

- big.LITTLE Architecture was created to assist in improving both CPU performance as well as lower CPU power draw
- There are different software implementations to using the big.LITTLE for different applications.
- Upgrading the current A7 and A15 Processors to future processors will allow the big.LITTLE CPU design to continue to be used in devices for years to come.

References

https://www.arm.com/products/processors/technologies/biglittleprocessing.php

http://www.ubergizmo.com/2013/01/what-is-arm-big-little/

Questions?