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PhLock: A Cache Energy Saving Technique Using Phase-Based Cache Locking

The core of the paper is focused on dealing with the aspect of power utilisation in general purpose embedded systems CPU’s, as they are wide spread with the advent of consumer electronics like cellphones. The biggest obstacle that such devices face is of power utilisation, being restricted by ever shrinking device sizes. The cache by itself pulls in upto 50% of the entire power during system execution, and as a result it is crucial to focus and improve its performance.

One of the key techniques to improve performance of cache’s is locking which can be implemented statically of dynamically. Static locking requires knowledge of application execution and behavior during runtime, and though lots of research backing this type has been presented in the paper but it is quite obvious that it can't be directly related to embedded systems cache. On the other hand the technique of dynamic locking suffers from similar pitfalls as its static counterpart in terms of data and instruction caches. This fails during real world scenario where the requirement of these caches by the application differs greatly, and using the same strategy on both instruction and data caches will result in increased cache miss which obviously degrades its performance.

In order to tackle such problems the author presents a new dynamic locking mechanism termed as PhLock. This technique utilizes different locking mechanism for instruction and data as well as utilizing dynamic monitoring of application behavior to manage cache locking. PhLock looks for “persistent phase” in application code for blocks of code and locks the required data. It also keeps a check on performance metrics to verify if the locking strategy being applied is proving to be efficient or not.

The author has demonstrated a totally new approach to improve power consumption by optimizing cache performance, and as demonstrated by comparison with other strategies this proves to have better performance optimisation.

Tosiron Adegbija, Ann Gordon-Ross:

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