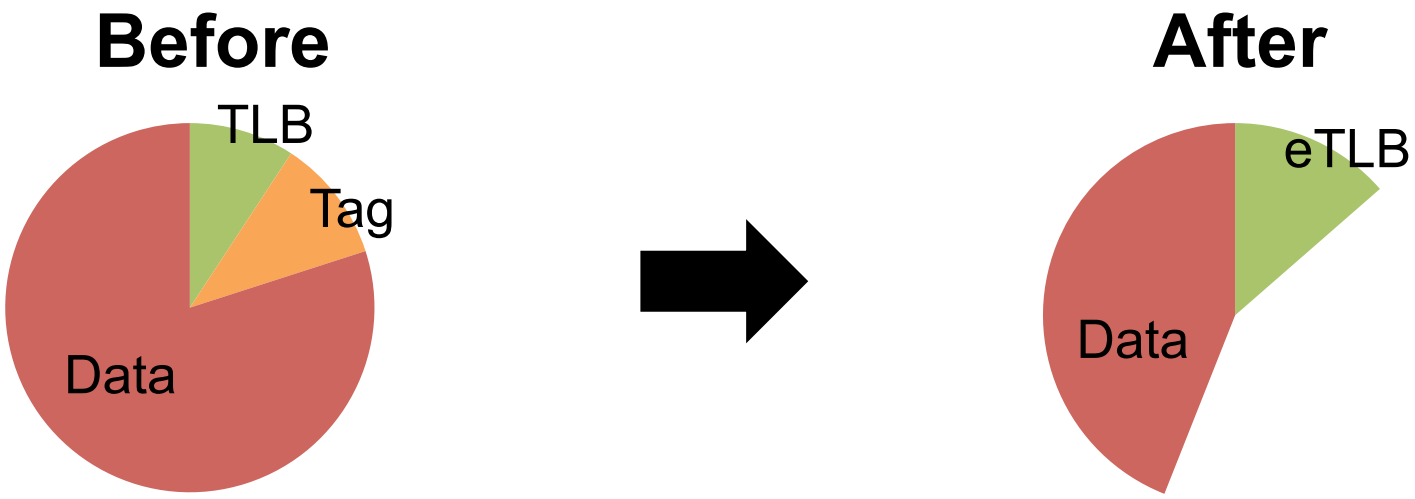
TLC: A Tag-Less Cache for Reducing Dynamic First Level Cache Energy

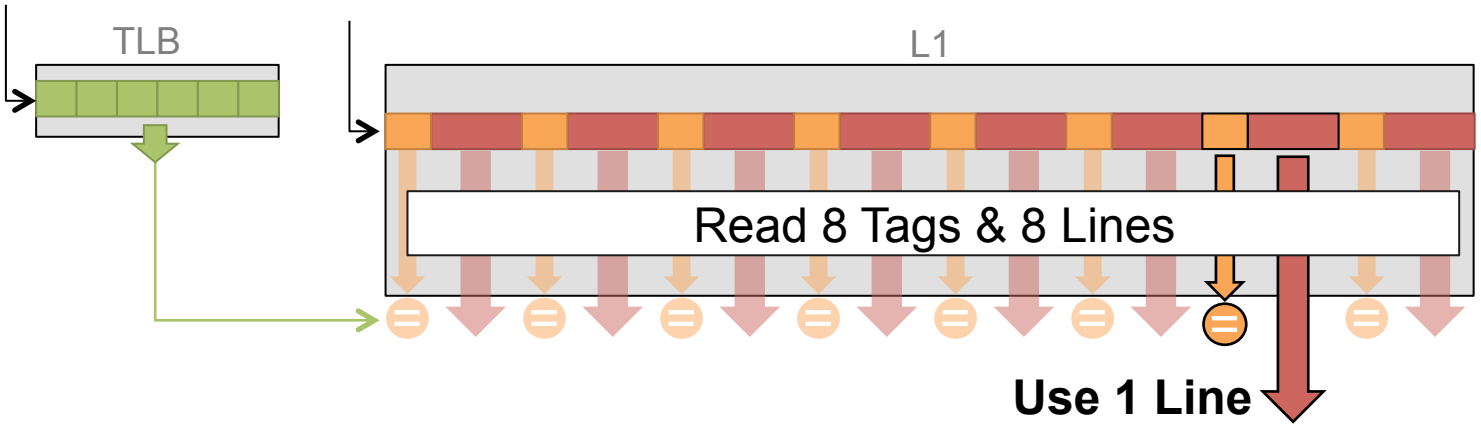
Andreas Sembrant, Erik Hagersten, David Black-Schaffer
Uppsala University, Sweden

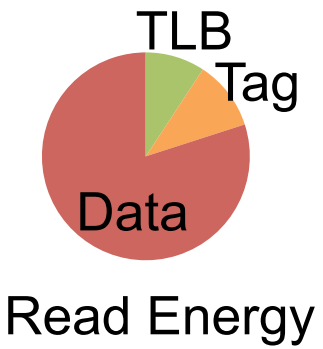
14:00 Session 1B - Energy Optimizations [Alpha Gamm Rho Room]

L1D Dynamic Read Energy



Problem: L1D consumes energy due to tags and ways





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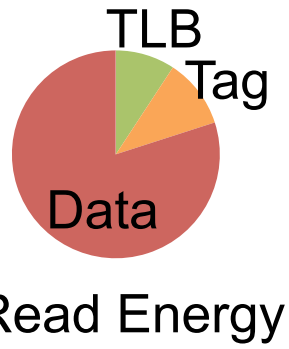
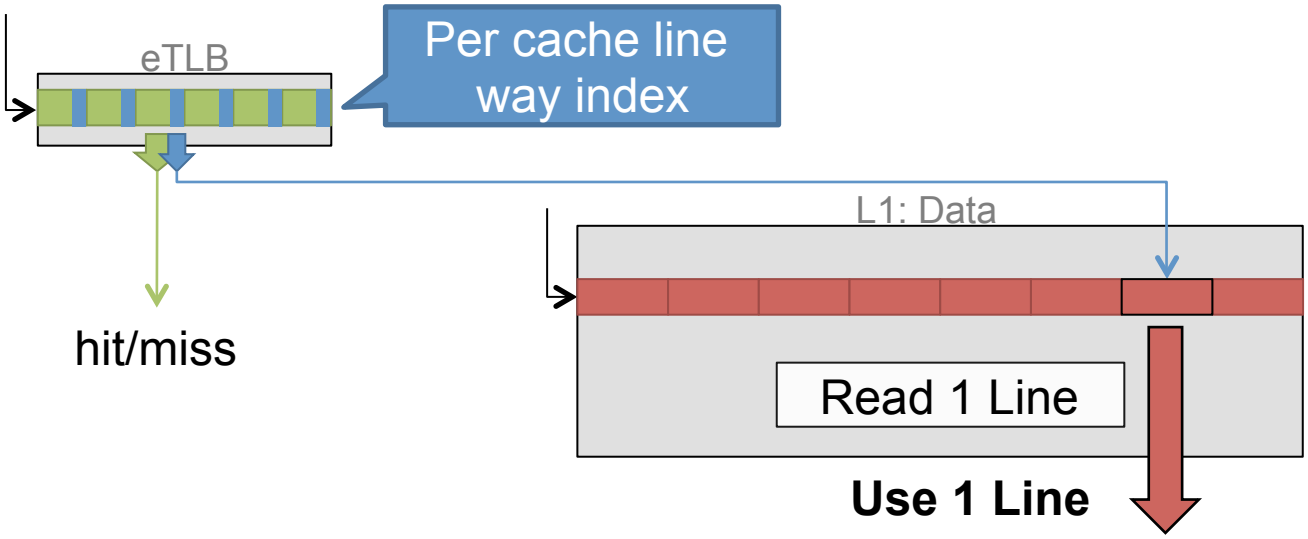
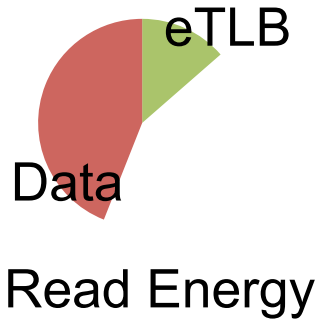


Solution: extend the TLB to *eliminate* ***tags*** and *find* ***the way***





Results

Reduce total L1D dynamic energy by 78%

1. **Eliminate extra data-array reads**
   - *by determining the correct correct way from the TLB*
2. **Eliminate the tag-array**
   - *by avoiding tag comparisions*
3. **Filter out cache misses**
   - *by checking in the eTLB*
4. **Amortize the TLB lookup energy**
   - *by integrating it with way information*

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- **More cool stuff in the presentation:**
  - *µPages, synonyms, coherency, replacements, …*

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