Speculative DMA for Architecturally Visible Storage in Instruction Set Extensions

Coherence is a serious concern

Solution: Speculative DMA

Cost function:
\[ M(C) = \lambda_{\text{software}}(C) - (\lambda_{\text{hardware}}(C) + \lambda_{\text{DMA}}) \]

Profiling:
\[ \lambda_{\text{DMA}} \Rightarrow \lambda_{\text{DMA}}(B) \]

where:
\[ \lambda_{\text{DMA}}(B) = \frac{\lambda_{\text{DMA}}}{N_B} \]

Performance gains by speculation

Hardware Architecture:
Cost function:
\[ M(C) = \lambda_{\text{software}}(C) - (\lambda_{\text{hardware}}(C) + \lambda_{\text{DMA}}) \]

Solution:
Coherent DMA

Experimental results

Opportunistic speculative DMA

Cost function:
\[ M(C) = \lambda_{\text{software}}(C) - (\lambda_{\text{hardware}}(C) + \lambda_{\text{DMA}}) \]

REFERENCES