

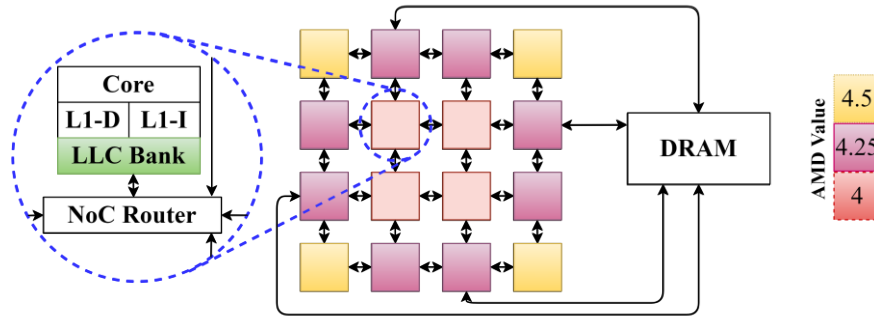
Thermal management for S-NUCA Many-Cores via Synchronous Thread Rotations

Yixian Shen, Sobhan Niknam, Anuj Pathania, Andy D Pimentel

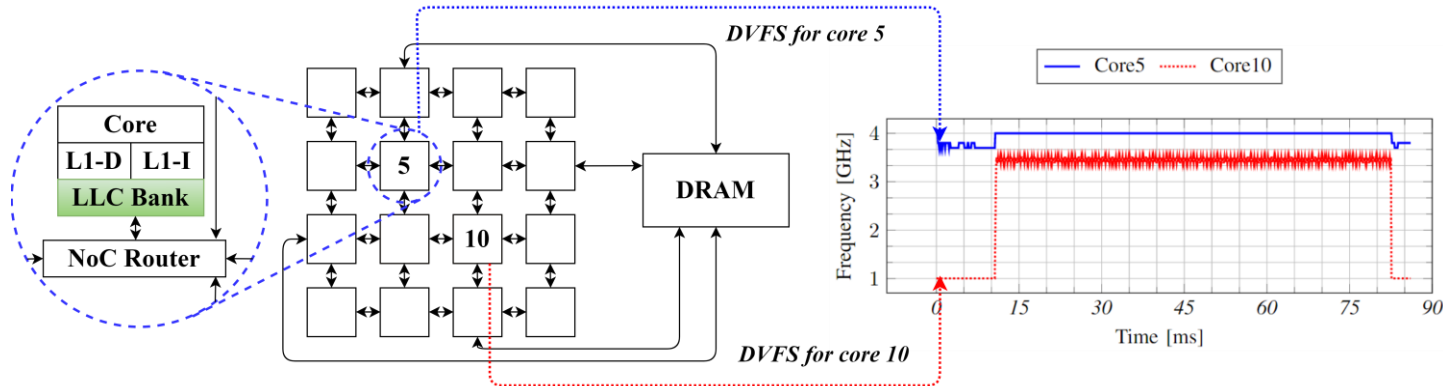
S-NUCA many-cores suffer from thermal issues

- ❑ LLC cache → Logically shared but physically distributed

Inherent Heterogeneity (Cache latency is non-uniform)

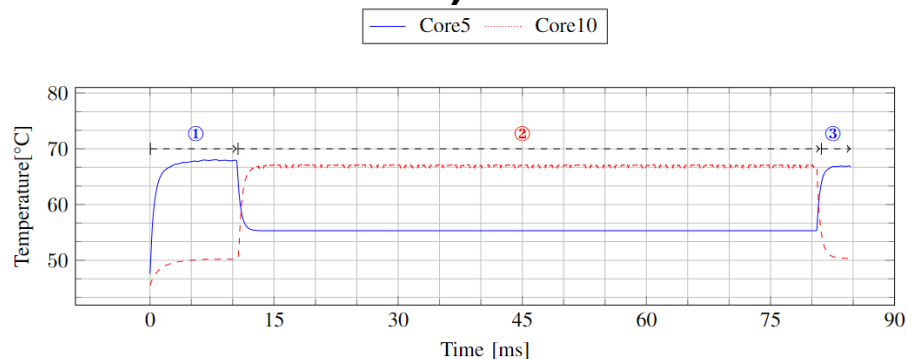
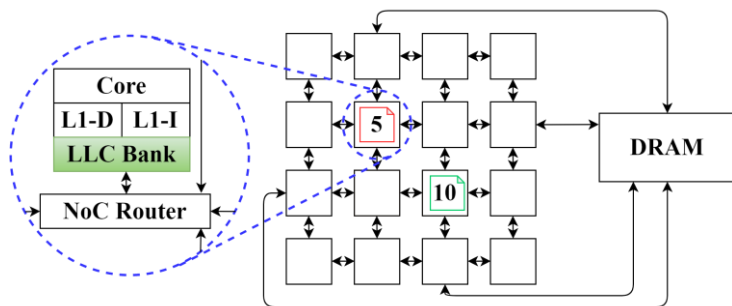


- ❑ DVFS-based DTM introduces the significant performance degradation



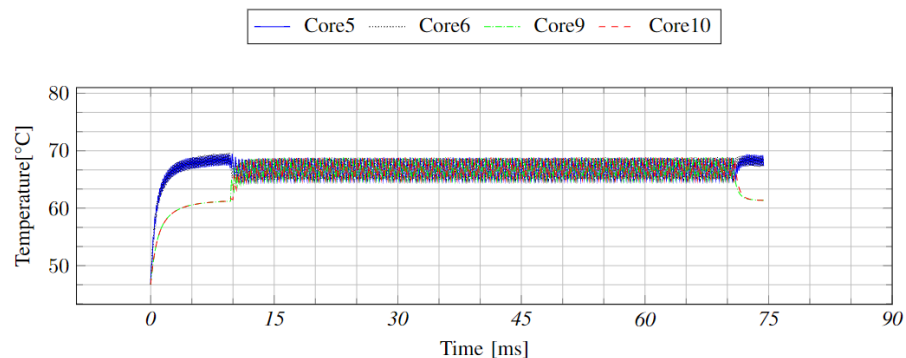
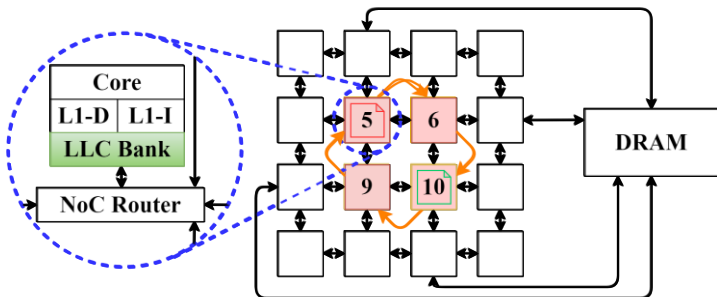
Thread rotations penalty < DVFS-based penalty

❑ DVFS based DTM for blackholes (Master+Slave threads)



❑ Thread rotations for blackholes (Master+Slave threads)

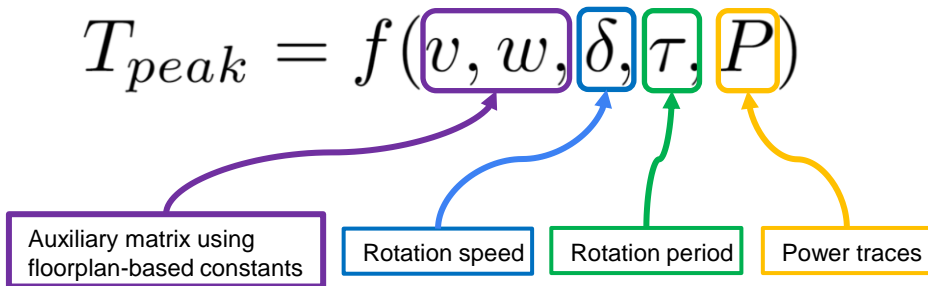
Slave threads in blackhole (Core5) → Core6
Slave threads in blackhole (Core10) → Core9



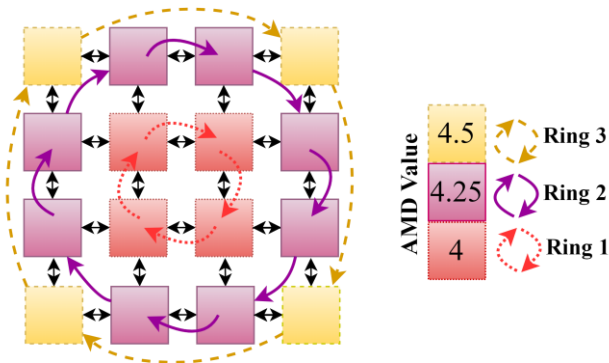
Hot-potato scheduling

- ❑ A theoretical **one-shot peak temperature calculation**

$$T_{peak} = f(v, w, \delta, \tau, P)$$



- ❑ A **thermal and architecture-aware** *thread rotations scheduler*



- ❑ Access cache latency
Ring1 < Ring2 < Ring3

- ❑ Thermal dissipation condition
Ring1 < Ring2 < Ring3