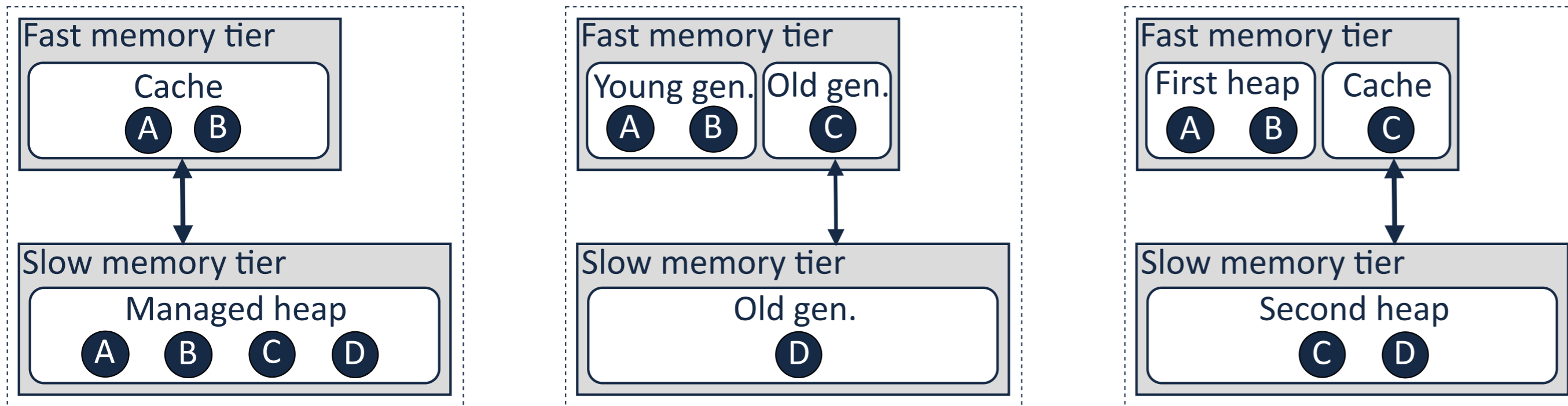


DynaHeap: Dynamic Division of DRAM between Heterogeneous Managed Heaps

Iacovos G. Kolokasis, Shoaib Akram, Foivos S. Zakkak, Polyvios Pratikakis, and Angelos Bilas

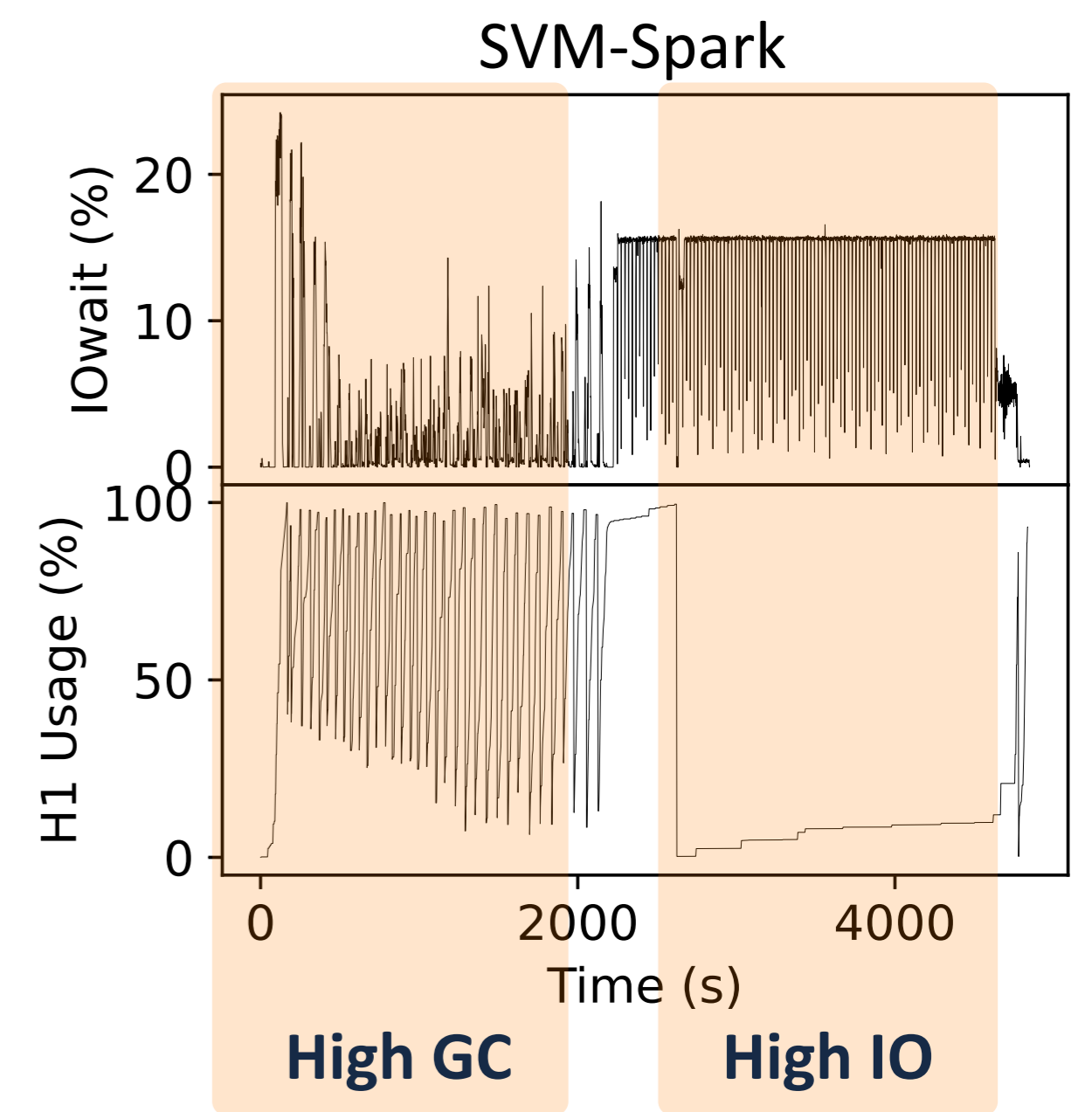
Big Data Frameworks Need More Memory

- Data grow at an exponential rate, but DRAM scales slower than the data growth
- Existing works extend the managed heap over NVMe SSD, NVM, or remote memory



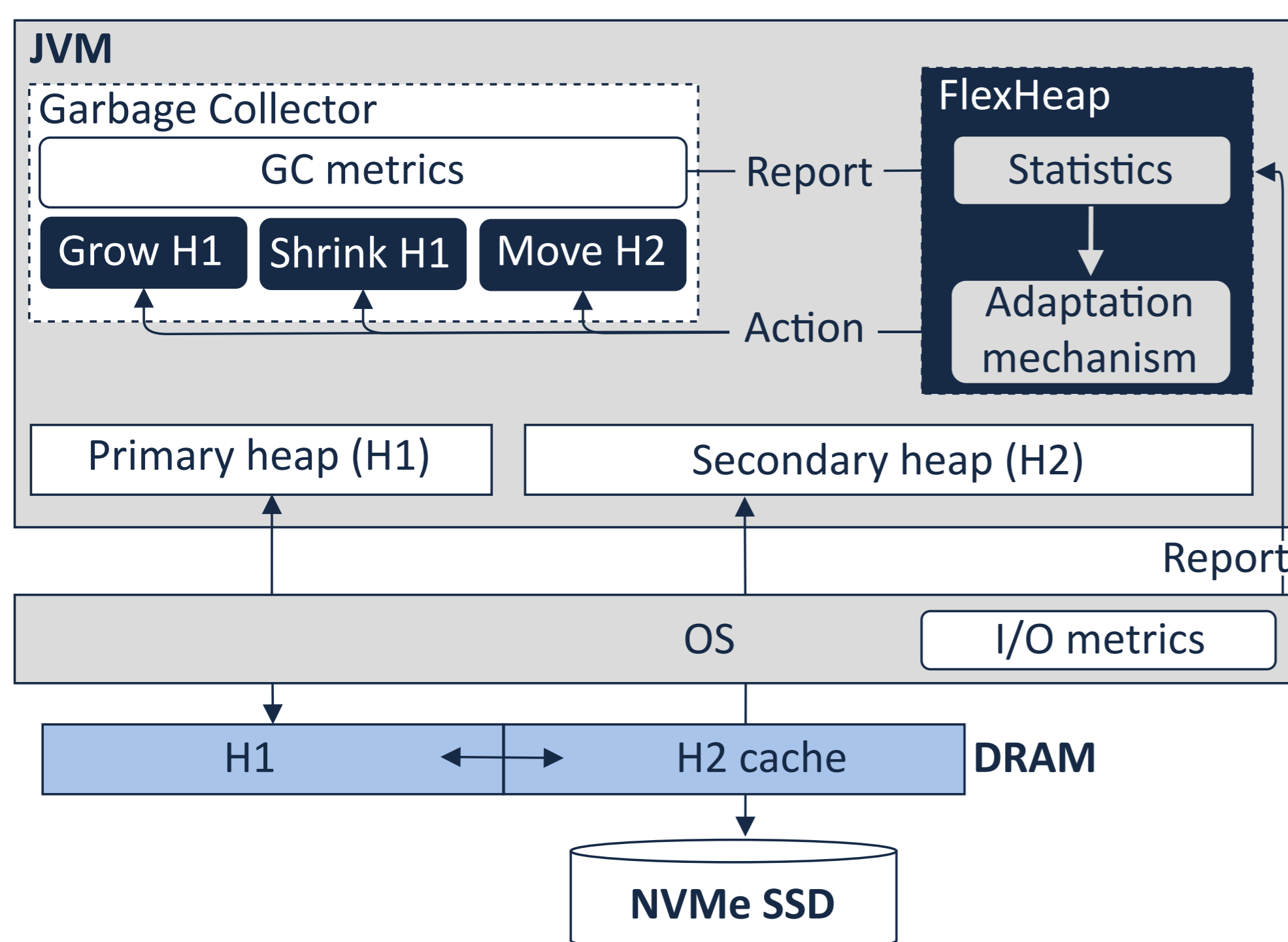
- + No object reference adjustment
- GC scans over the slow tier
- + Reduce GC scans over the slow tier
- Need object reference adjustment
- + Avoid GC scans over the slow tier
- + No object reference adjustment
- Static DRAM division

Static DRAM Division Limitation

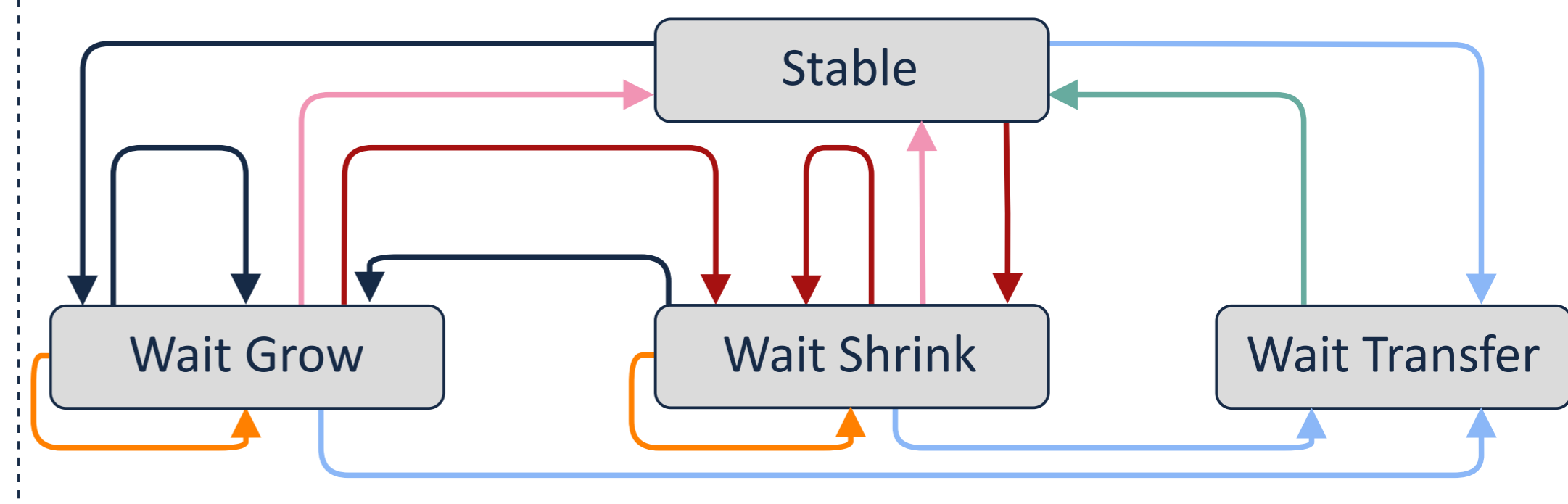


- Static DRAM division **cannot cope with changing application behavior**
- High GC: need space for the first heap
- High IO: need space for cache

DynaHeap: Dynamic Division of DRAM

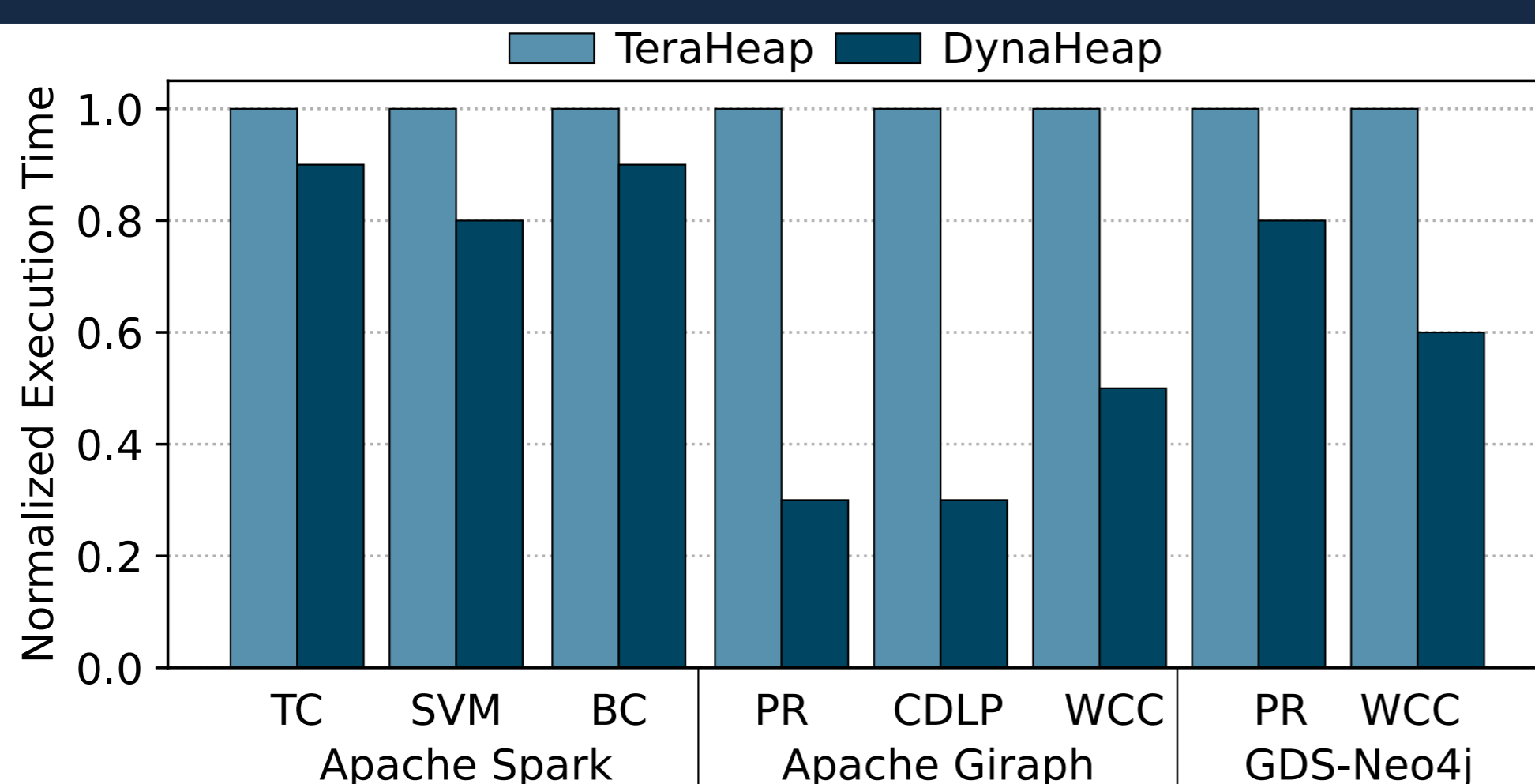


Adaptation mechanism: Adjust memory between H1 and I/O cache



	Condition	Action
→	High GC	Grow H1
→	High GC and many objects can be moved to H2	Move H2
→	High I/O	Shrink H1
→	Unused memory	-
→	Next GC event	-
→	Reset actions	-

Preliminary Results



Key Takeaways

- Applications have different memory requirements at different periods
- Static division of DRAM between H1 and the cache for H2 cannot adapt to dynamic changing application behavior
- DynaHeap is on average 70% better than TeraHeap

