Dynamic Page Migration in Software DSM Systems

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Abstract

Dynamic page migration, when employed in Distributed Shared Memory (DSM) systems offers several advantages: (i) reduces the latency of memory accesses, (ii) improves resource utilization by considering the computational and communicational needs of the applications and adapting to the changing resource availability, and (iii) achieves the above with lower overhead than traditional approaches that rely on thread migration.

We propose a simple and efficient page migration mechanism [1], that dynamically allocates shared memory pages to home nodes. Each page has a designated home node and nodes that heavily modify the pages can become their new homes. In our protocol, to avoid redundant page transfers, we perform migration only when the number of modifications of a page becomes larger than a threshold. The migration information is piggybacked on the existing synchronization messages to minimize the communication overhead. The migration decision is taken locally, at the home of each page. We have implemented our mechanism in the JIAJIA software DSM [2]. Performance evaluation using real application benchmarks shows that our mechanism significantly reduces remote page modifications, improves memory access latencies, and achieves better performance than its competitors. We observe that the cost of executing the algorithm and of migrating the pages is amortized by the benefits gained.

Keywords: Distributed Shared Memory, page forwarding, data migration.

References

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