

Memory Disaggregation

For Expansion and Sharing in Blade Servers

Motivation

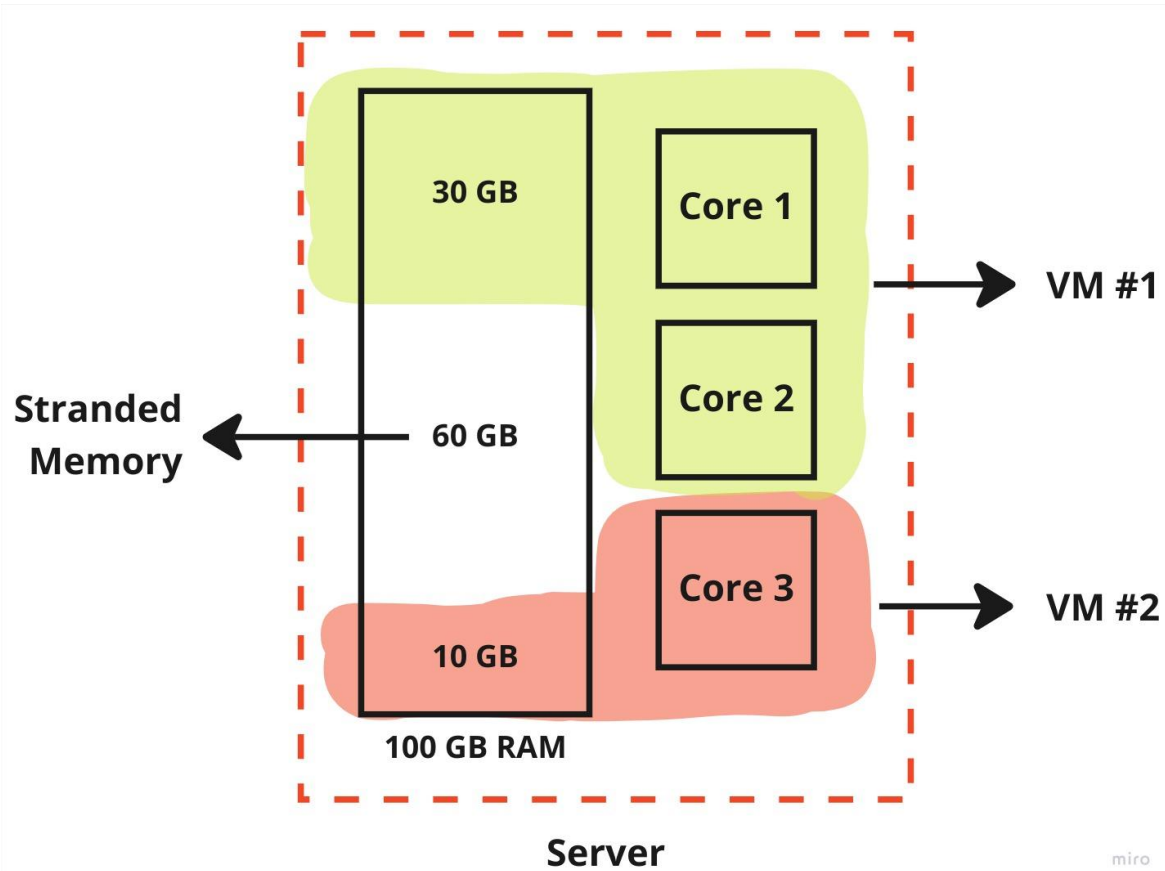


Fig: Memory Stranding

Motivation

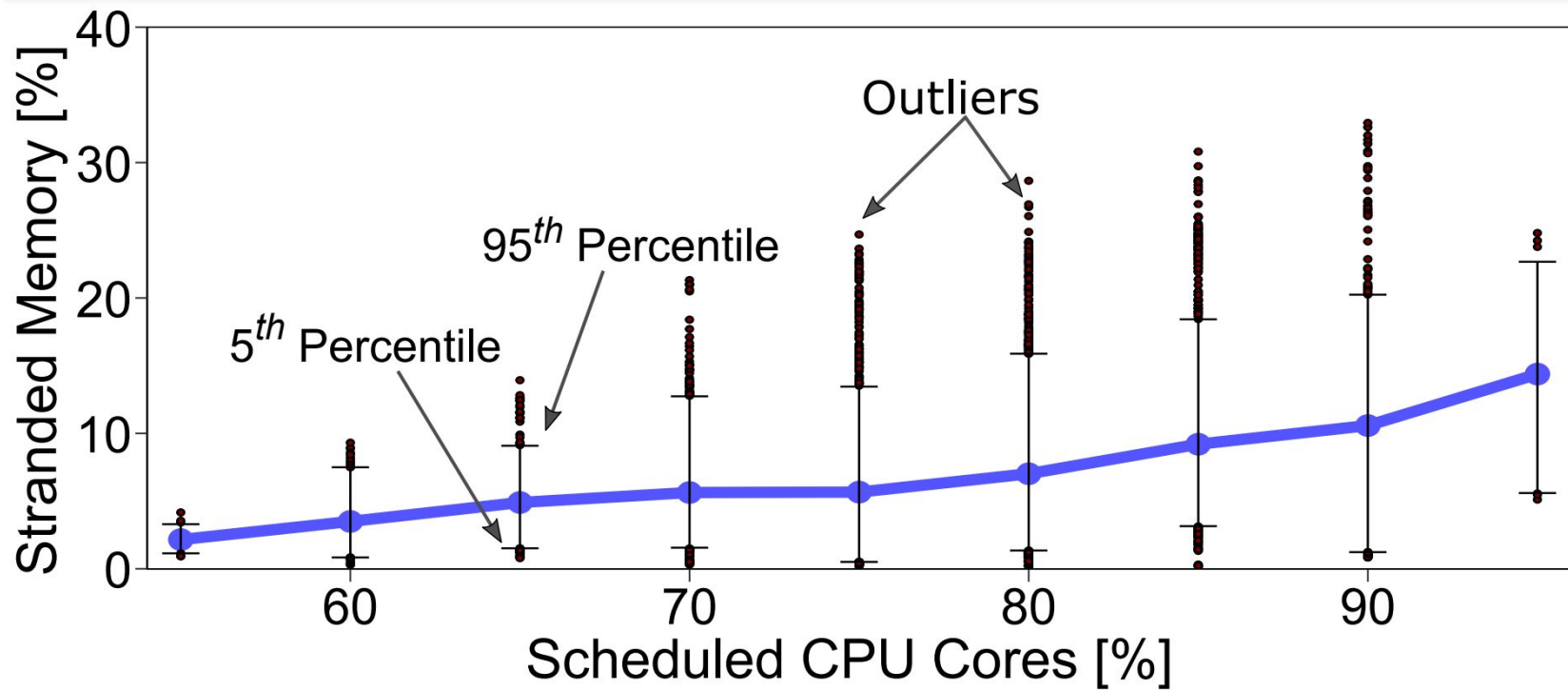


Fig: Memory stranding

Approach

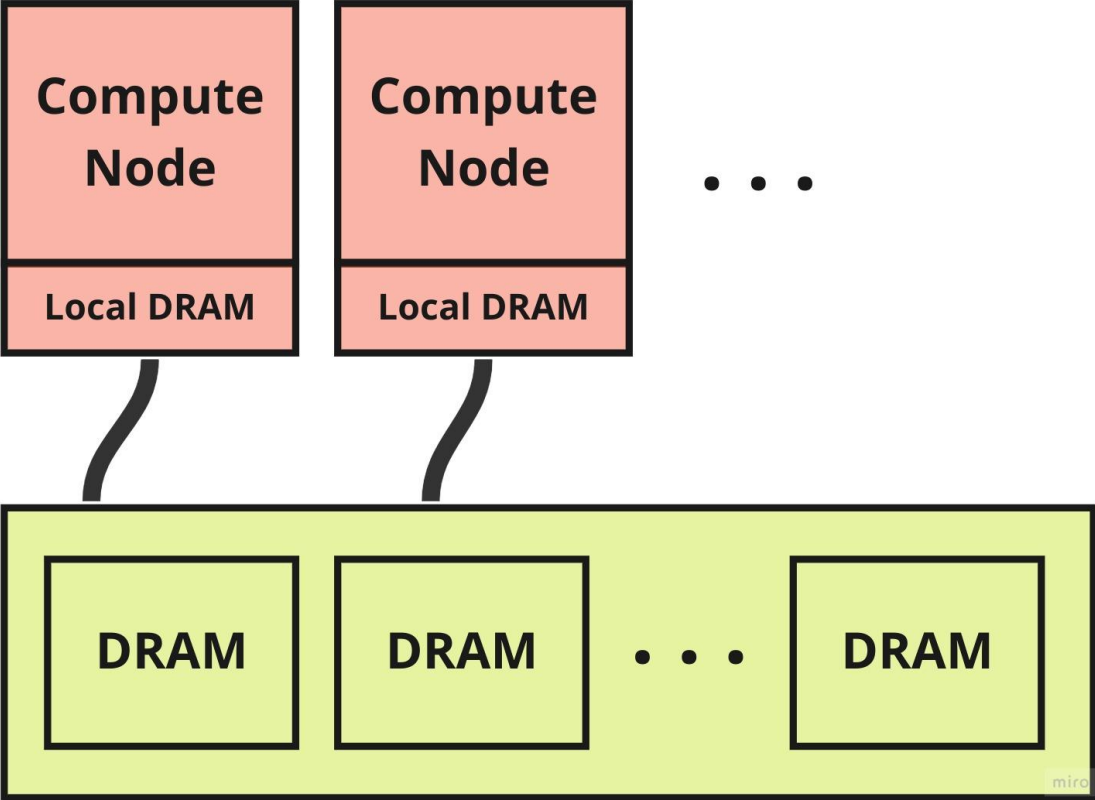


Fig: Distributed Shared Memory

Approaches to building Memory Disaggregation

1. Blade Servers

2. RDMA

3. CXL

Memory Disaggregation with Blade Servers



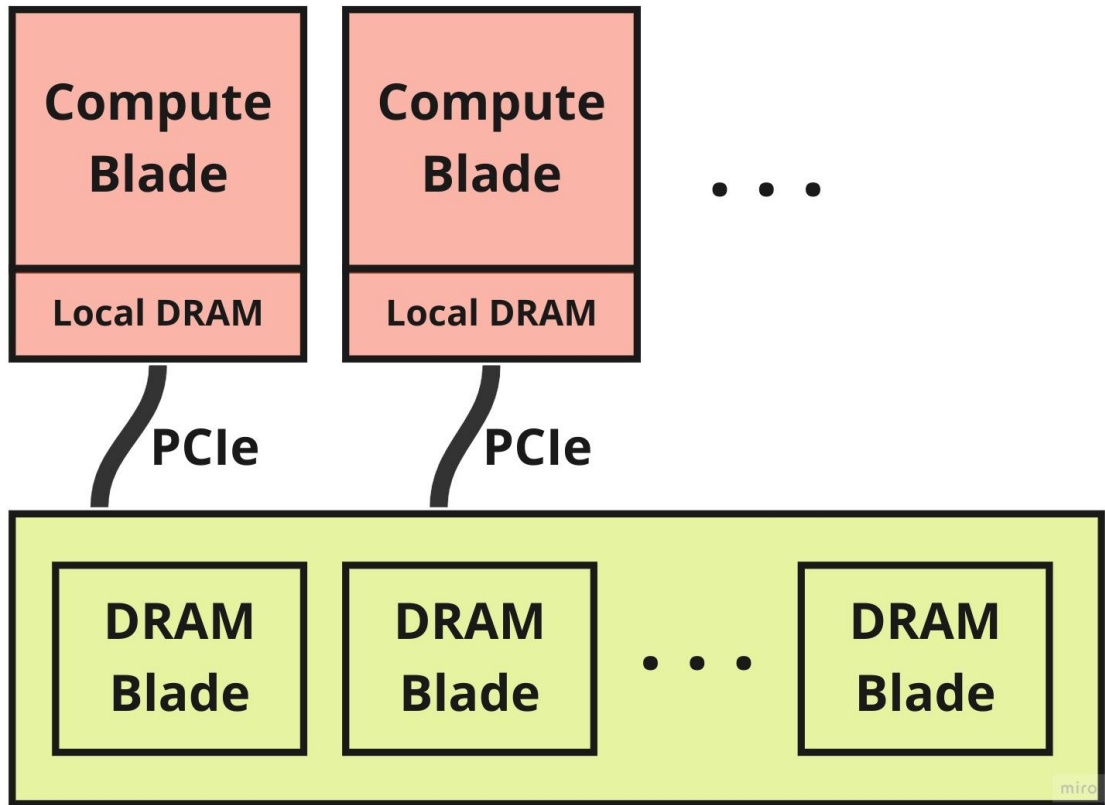


Fig: Blade Server Implementation of Shared Memory

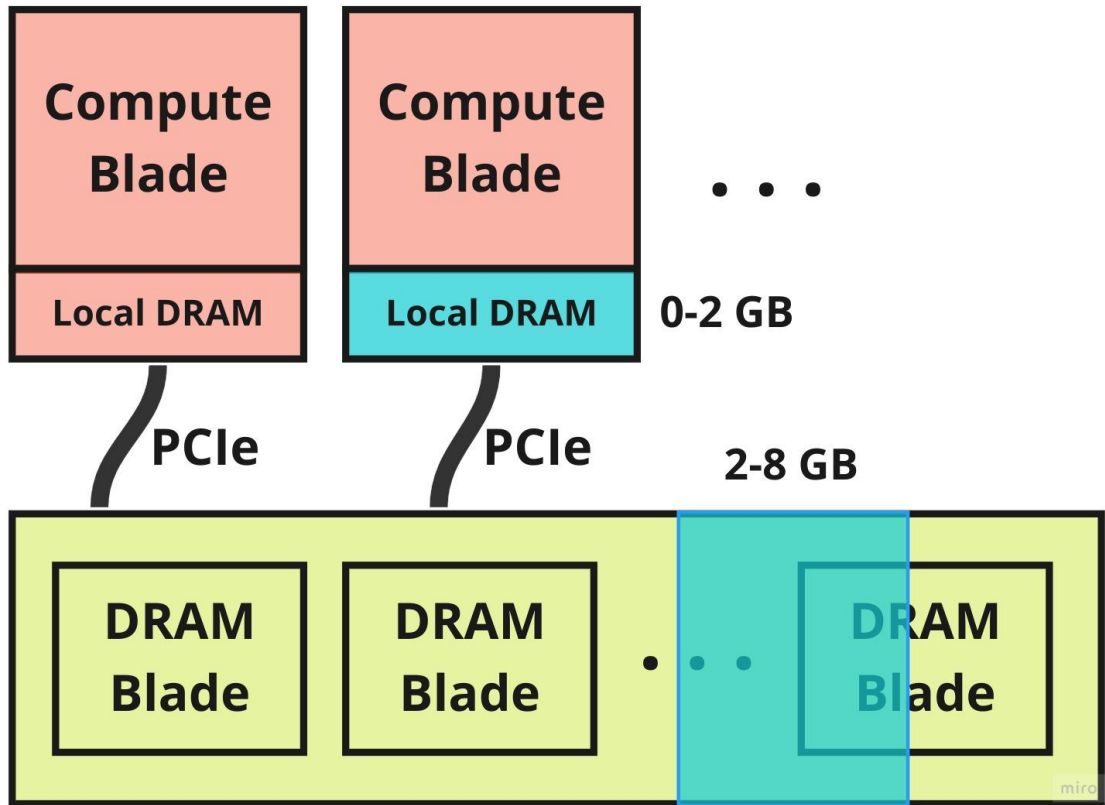
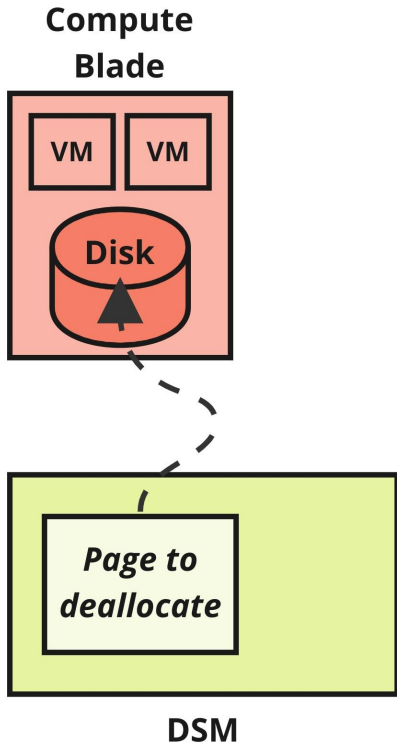
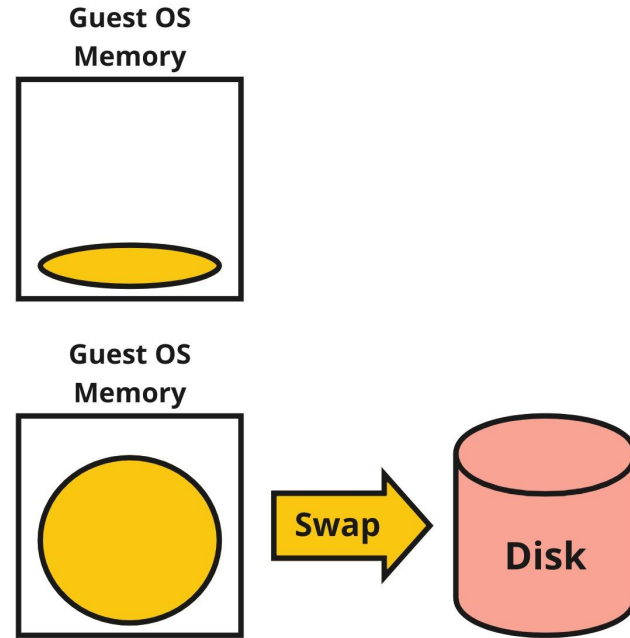


Fig: Blade Server Implementation of Shared Memory

Re-Allocation Strategies



Approach 1



Approach 2

PCIe Page Level Memory Access

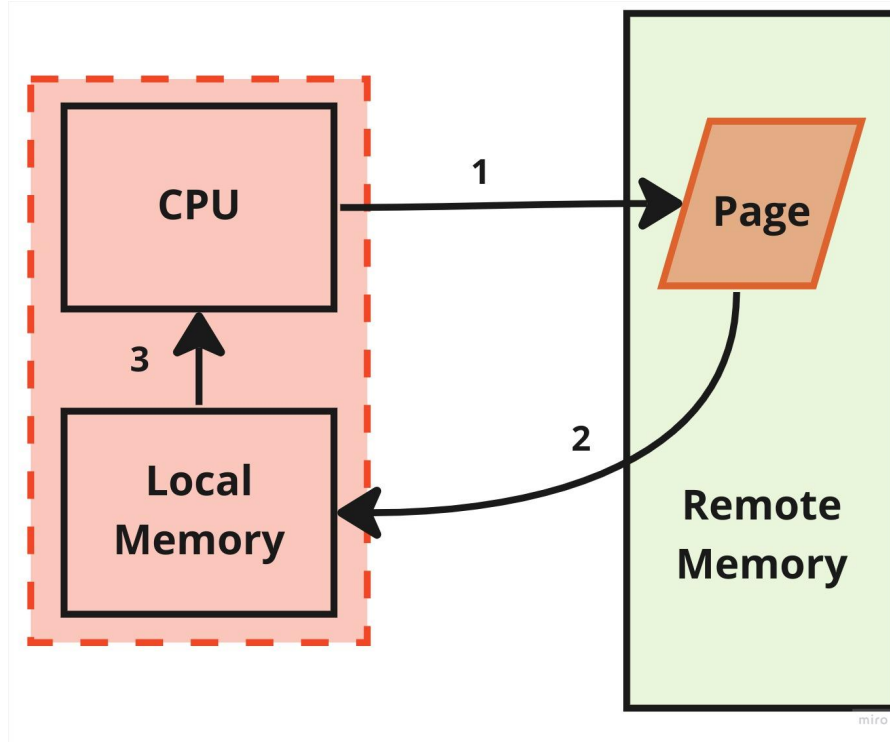


Fig: Blade Server Implementation of Shared Memory

PCIe Fine Grain Memory Access

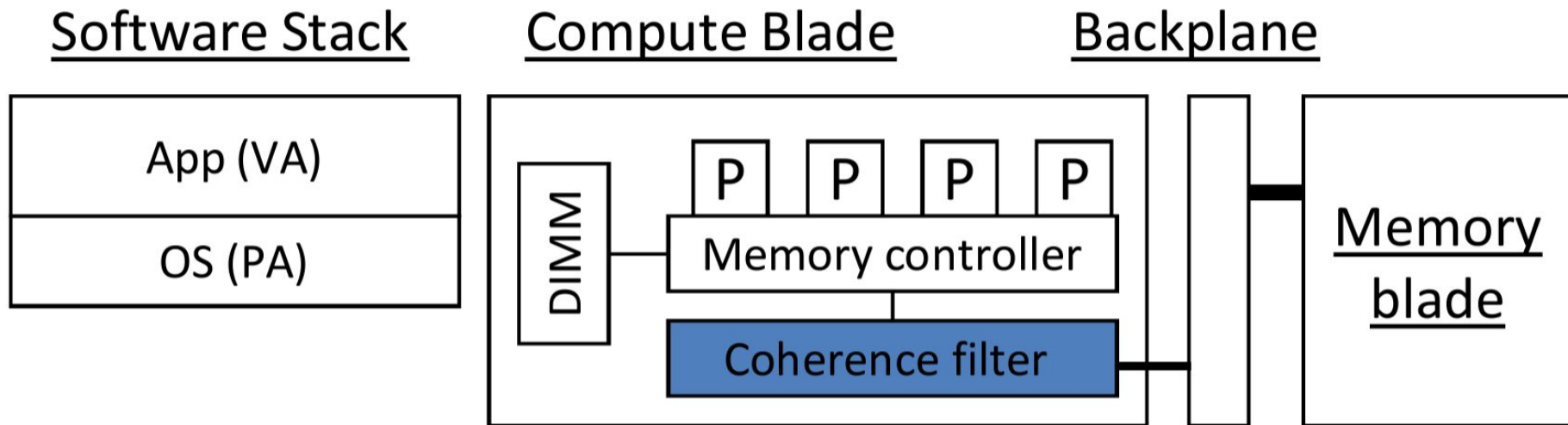


Fig: Blade Server Implementation of Shared Memory

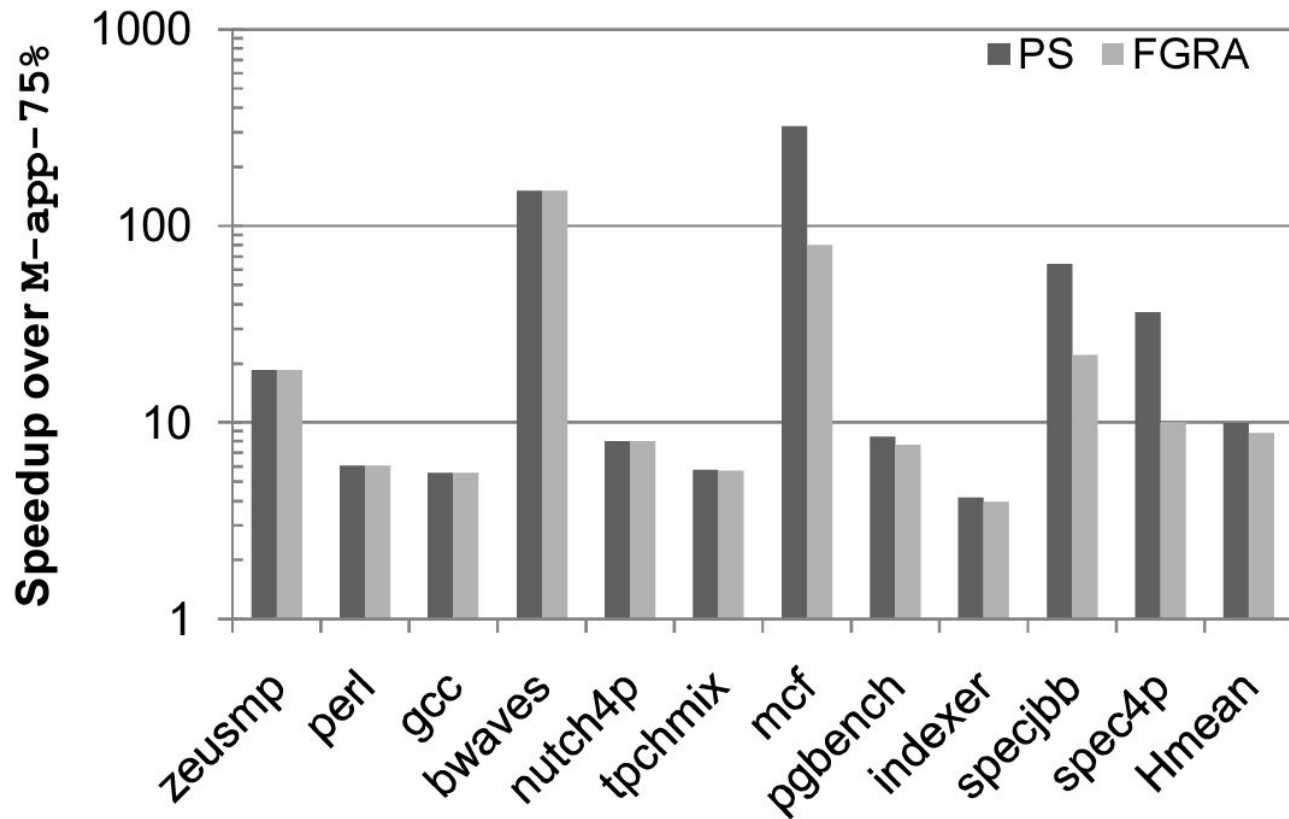


Figure: Speedup with Blade Server Memory Sharing

RDMA for Disaggregation

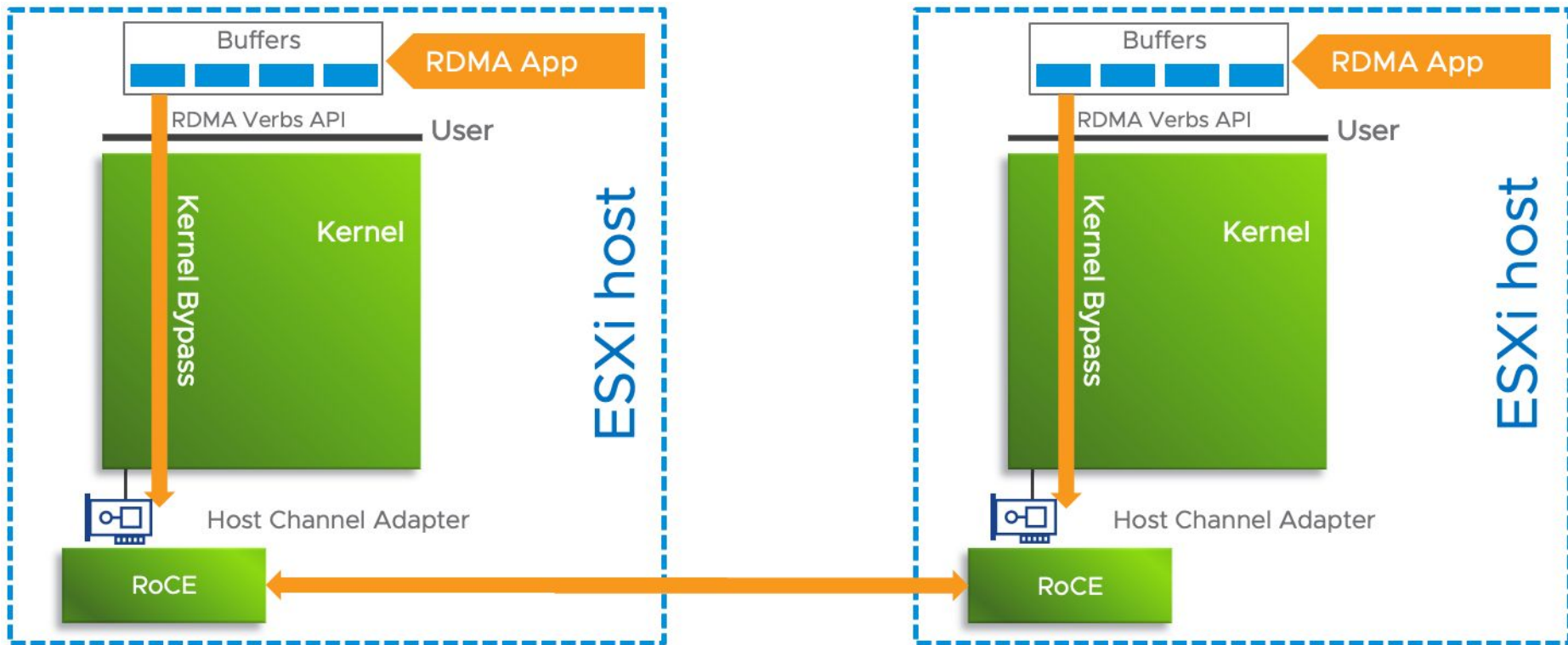


Fig: RDMA remote memory access



DSM Challenges

- Durability
- Concurrency Control
- Cache coherence
- Buffer Management
- Index Design