

Performance evaluation of cluster computing system based on differences in computing resources

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Abstract: This study evaluates the processing performance of a cluster computing system under varying computational resource configurations. As cluster architectures become increasingly prevalent for handling large-scale data processing, understanding the impact of heterogeneous resource allocation on system efficiency is critical. The research employs a series of benchmark tests designed to measure throughput, latency, and scalability across different node configurations, including variations in CPU core counts, memory capacity, and network bandwidth. Experimental results indicate that resource disparity significantly influences overall system performance, with load imbalance emerging as a primary bottleneck in heterogeneous environments. Specifically, clusters with uneven resource distribution exhibited up to a 30% reduction in processing efficiency compared to homogeneous setups for compute-intensive tasks. The findings underscore the importance of resource-aware scheduling algorithms and provide quantitative insights for optimizing cluster deployment in real-world applications. This study contributes to the field of distributed computing by offering a systematic performance assessment framework that can guide the design of more resilient and efficient cluster systems.

Keywords: performance evaluation, cluster computing, computational resources, resource heterogeneity