# Experimental Comparison of Load Imbalance Metrics using Temporal Agregation for Homogeneous and Heterogeneous Platforms

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***Abstract*—A desirable goal in HPC parallel applications is the even distribution of workload among computational resources. While these resources can be homogeneous or heterogeneous, we have partitioning and balancing strategies for each one. Before making decisions regarding load redistribution, it is imperative to identify and measure the load state accurately. Load Imbalance Metrics are a valuable option to characterize computational load distribution by measuring performance, time, and the degree of imbalance. However, the metrics are usually calculated for the whole application execution generating a single value to characterize how the work is distributed and unmodified to consider different resource computational capacities. We select five state-of-art metrics and present an experimental evaluation of them with two applications with well-known load imbalance problems: the Ondes3D Earthquake Simulator, running in a multi-node homogeneous environment, and the Chameleon's Cholesky Factorization in a single heterogeneous node with CPU/GPU. We considered the application's particularities, evaluating existing imbalance metrics tackling homogeneous resources, presenting new metrics tailored for heterogeneous platforms, and a detailed load balancing evaluation per application phase. Our results show that the selected metrics can bring valuable information on different imbalance scenarios, temporal integrations, and architectural environments. We present the benefits and challenges of the metrics, pointing the best options to evaluate the imbalance. Moreover, we believe that such a study can contribute to online load rebalancing decisions for application regions or phases.**

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