Aggregating Network Interfaces in Lightweight Virtualization Clouds for HPC Applications

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***Abstract*—In the recent past, we have witnessed continuous efforts to execute HPC applications in the cloud due to potential advantages, including higher scalability and lower costs using the pay-per-use billing. Although the industry and academy have adopted this model, there are still significant challenges to be addressed concerning network interconnection bottlenecks. One of them is that network-intensive applications may not scale in the cloud due to the sharing of the network infrastructure. Therefore, our proposal to overcome this loss of performance is the aggregation of Network Interface Cards (NICs) in a ready-to-use integration with the OpenNebula cloud orchestrator using lightweight virtualization. We conducted a set of experiments with a network microbenchmark to obtain throughput and latency network performance metrics and the NPB kernels considering execution time to analyze the performance impact on HPC applications. The results highlighted that the NIC aggregation approach improves network performance in terms of throughput and latency. Moreover, the HPC applications presented different performance patterns based on the behavior of each kernel, depending on the communication and the amount of data transmission. While network-intensive applications increased the performance up to 38%, other ones maintained the same or slightly decreased the performance.**