Today, data-intensive computing systems, such as scientific computing or big data applications, may involve large-scale computing resources and complex software and hardware components. In this talk, I will introduce one of my latest projects that uses adaptive resource management enabled by the container-based virtualization technique to automatically tune performance of parallel programs in cloud. In this project, the containers running on physical hosts can dynamically allocate CPU resources to parallel processes according to the current program execution state and system resource status. The resource allocations are adjusted by two ways: the intra-host level, which dynamically makes resource adjusted within a host; and the inter-host level, which migrates containers together with processes from one host to another. We have implemented and evaluated our approach on Amazon EC2 platform, which demonstrates that the performance can be improved up to 31.1% (with an average of 15.6%). In this talk, I will also go over our other work on big data, including an optimization technique for Hadoop Distributed File System (HDFS), which utilizes asynchronous multi-pipeline data transfers instead of a single-pipeline stop-and-wait mechanism in the current HDFS. Such a technique can improve the data transfer throughput of HDFS by 27-245%.

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