Load Balancing in Cloud Computing based on Ant Colony Optimization and Crow Search Algorithm

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Abstract— **With the rapid increase in cloud services and the increasing shift toward them, balancing the cloud load has become a critical research issue. The increasing demand from customers for technology services worldwide is largely due to its direct impact on performance quality. Therefore, to provide better service quality, it is essential to consider reducing response time and cost in load balancing. This paper addresses the load-balancing problem by optimizing response time and computing cost in cloud computing systems. Specifically, we first formulated the load balancing problem in cloud computing mathematically by designing an objective function that optimizes response time and cost, including constraints to ensure task assignment to a single virtual machine (VM) and resource limits are not exceeded. To solve this optimization problem, we proposed a hybrid algorithm, ACOCSA, that combines Ant Colony Optimization (ACO) and Crow Search Algorithm (CSA). We implemented the ACOCSA algorithm, evaluated the response time, cost, and load balancing metrics, and found that our algorithm performed better in terms of response time and computational cost, and showed good fairness among VMs.**

Keyword— **Load balance, Ant Colony Optimization (ACO), Crow Search Algorithm (CSA), Resource Management in the Cloud, Quality of Service (QoS), Cloud computing.**

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