Load Balancing Mechanism Based on Ant Colony Optimization in Could for IoT Application

Related work

An individual ant is a quite random and unordered insect in the world of animals, which shows us a quite similar characteristic to a piece of data stream. From a microscopical perspective, the behavior of the group of ant has a more stable and regular pattern as people can observe. Furthermore, many meaningful tasks can be implemented by the ant colony rather than the individual ant, such as foraging (searching for food), building nests [1, 2], moving material and so on. Always, the ant colony have the potential of optimizing a very complex problem by randomly exploring, modifying and deciding. This a collective behavior could be commonly seen from a group of social insects [3], which is “swarm intelligence” [4].

The ant colony algorithm from nature have been applied into many scenarios in load balancing mechanisms. One of the mechanisms was proposed by the Zehua Zhang and Xuejie Zhang. This mechanism is based on a combination of ant colony algorithm and complex network theory and specifically designed for open cloud computing federation [5]. Their work was realized in an agent-based system, where each task can be deemed as an ant. A lot of cloud computing service provider’s will always result in many management regions and those regions could be viewed as a complex network. Each task starts at a node of the network periodically, the route it walked would have pheromone. The existing load on the network will influence the path of ant colony. Also, the pheromone left by ant would indicate the path the rest should go. An ant can remember the overload path and update it by leaving pheromone [5]. This mechanism is quite useful in handling complex network in load balancing issues.

There is a Load Balancing Ant Colony Optimization algorithm aiming at finding optimal resource allocation for tasks in dynamical cloud system [6]. It can balance the whole system while reducing the average running time for tasks. The simulation is based on CloudSim which offers hosts, virtual machines, applications and so on. In this work, we view all VMs as different nodes with random initial pheromones. Then let the ants begin at starting nodes to propagate and update pheromone after each iteration. Measure the makespan for tasks and calculate total execution time of tasks in the end. In this case, a well-balanced load across Cloud and nodes should be achieved.

With network model and optimization ant colony algorithm, we are going to combine the advantages of ant colony algorithm and apply it into smart-city to solve similar issues. Furthermore, comparison will be made to check performance based on the simulation results for smart-city.

**Ref**

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