National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: On the Development of Hybrid Optimization Techniques for Containerized Cloud
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Venue	: Convention Hall (CS-208), CSE Department
Date and Time	: 30 Dec 2024 (10.00AM)
Abstract	:

Container-as-a-Service (CaaS) in the cloud has emerged as a prominent cloud computing paradigm, providing developers with a convenient platform for deploying and managing containerized applications. In CaaS environments, efficient resource management is crucial for optimizing performance, minimizing costs, and ensuring the timely execution of tasks. Makespan, the total duration required to complete a set of tasks or jobs, is a critical metric for evaluating resource utilization and workload efficiency. This research explores the development of makespan-aware resource optimization strategies tailored explicitly for containerized clouds. It also talks about the architecture of the CaaS model and the basic ideas behind containerization, the advantages of resource isolation, scalability, and portability in CaaS when deploying and managing applications using containers.

The main objective of this research is to propose different hybrid optimization approaches for minimizing makespan in the containerized cloud while maintaining the required Quality of Service (QoS). Improvements in resource use at the server and virtual machine levels help to achieve the goal. First, a meta-heuristic approach for load balancing in the CaaS cloud is proposed to distribute incoming workload across available resources in a balanced manner, minimizing makespan and optimizing resource utilization. Next, a Fractional Pelican Optimization VM sizing is proposed, which makes use of Deep-ConvLSTM to minimize the makespan, task rejection rate and response time. Then, a Fractional Pelican Hawks Optimization (FPHO) based container consolidation is proposed to enhance the system performance where energy consumption, resource utilization, SLA violations, and makespan are considered as the performance metric. Simulations show that all three approaches improve the performance of the containerized cloud system. This research enhances the state of the art through the following key contributions:

- A detailed survey of resource management strategy in containerized cloud.
- An approach for load balancing in containerized cloud.
- An efficient VM sizing technique for hosting containers in the cloud.
- A framework for consolidation of containers in the containerized cloud.