NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

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Distributed Task Offloading

In a Multi-tier Cloud Infrastructure

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Introduction

With the advent of edge computing, computational servers were brought closer to end devices to reduce the latency of offloading tasks. This has led to a sharp rise in the number of mobile-edge applications. Due to the heterogeneous requirements of such applications, efficient resource management in an edge infrastructure is challenging.

Objectives

- Propose a distributed task offloading algorithm that utilizes Ant Colony Optimization (ACO) besides an updated multi-tier cloud infrastructure to execute it
- Implement an asynchronous distributed environment to evaluate and compare its performance with its centralized counterpart (seen in Experiments section)

Methodology

- System architecture comprises offloading servers which are deployed at the edge of the cloud infrastructure as seen in Fig. 1
- The distributed algorithm comprises 3 stages: Search Phase, Transition Phase and Agreement Phase (Distributed Consensus) as seen in Fig. 2

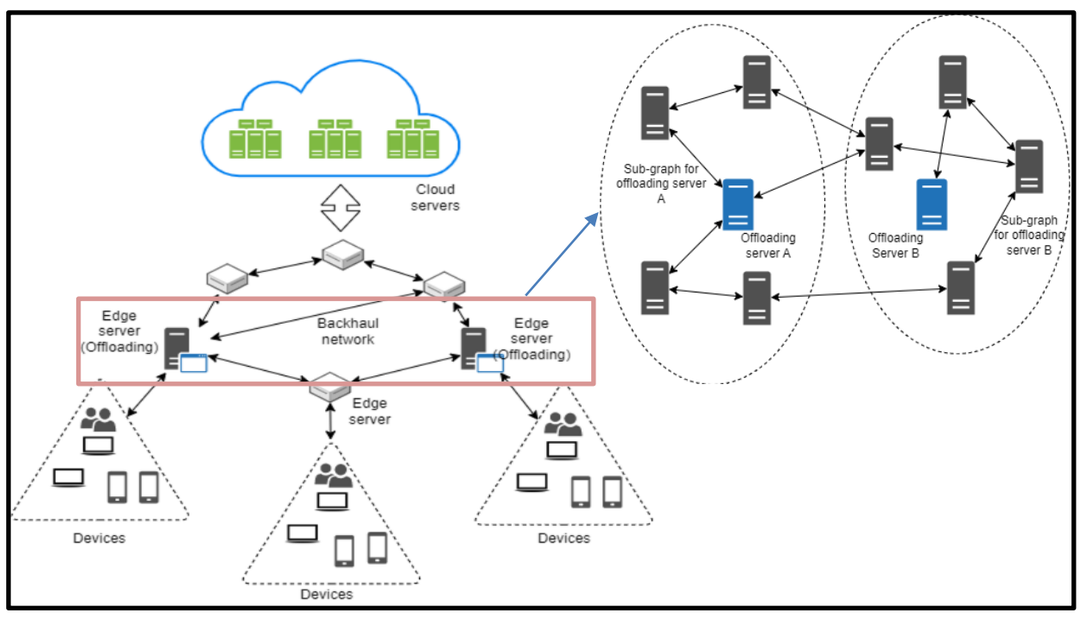

Figure 1: Multi-tier Cloud Architecture

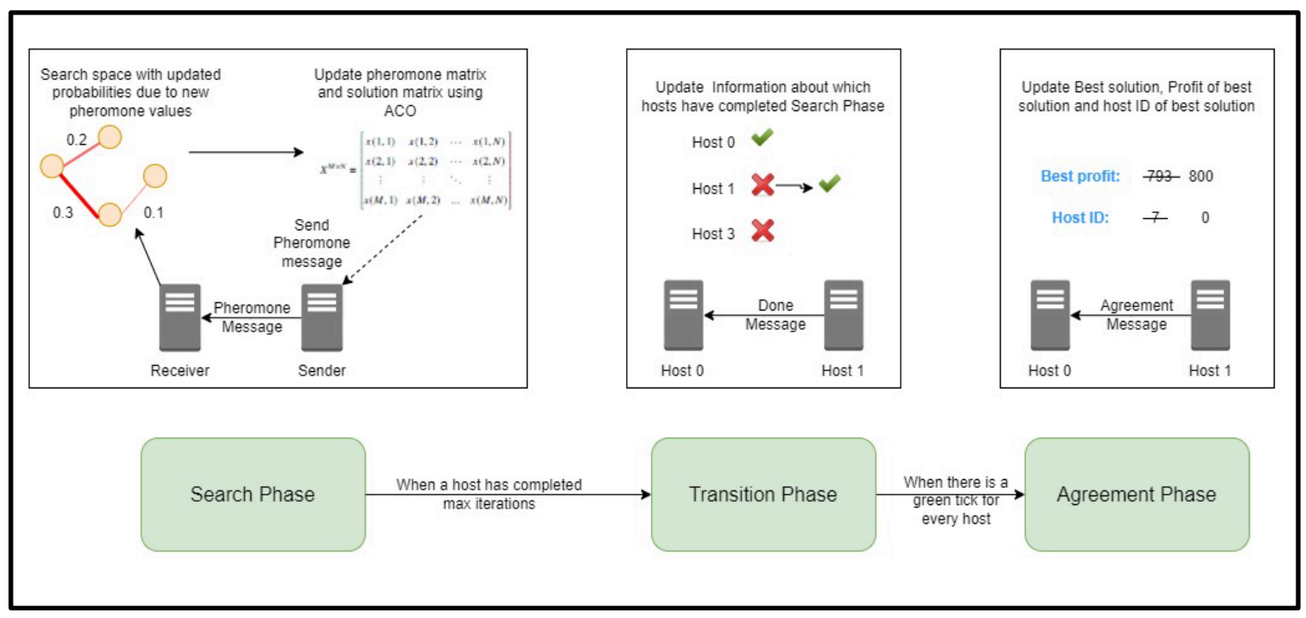

Figure 2: Flowchart for the distributed algorithm

Experiments & Results

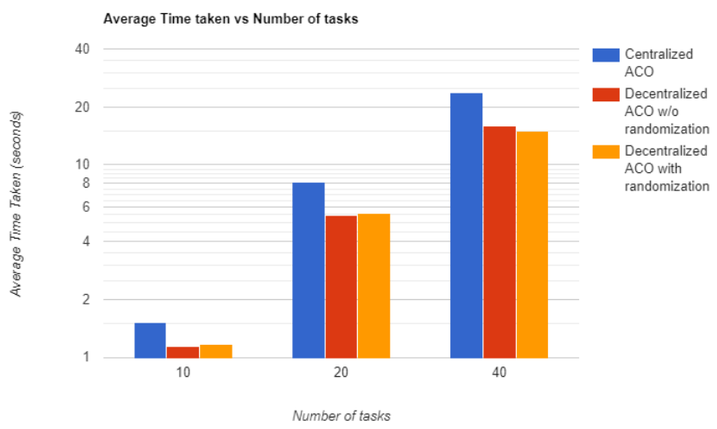

Figure 3: Distributed algorithm takes significantly lesser time to compute solution

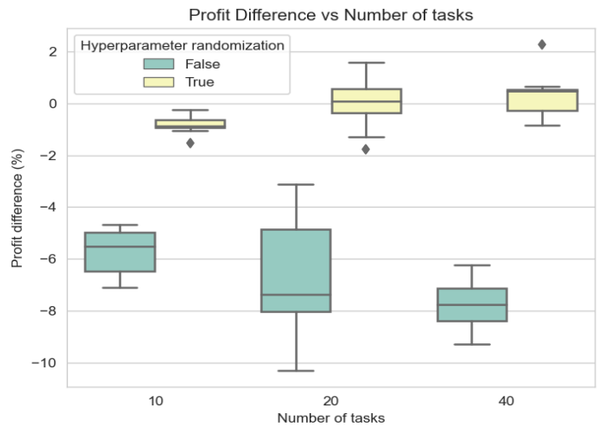

Figure 4: Distributed algorithm computes solutions with similar profits

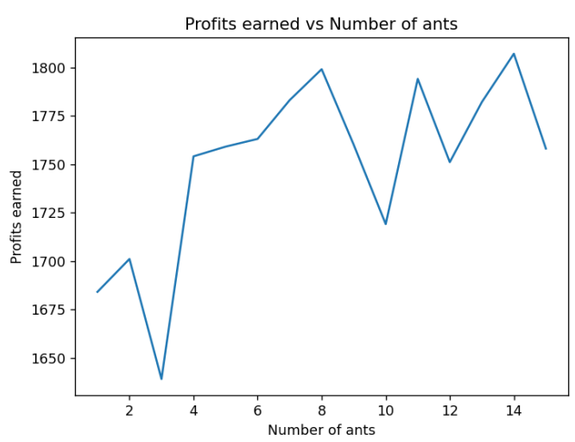

Figure 5: Distributed algorithm makes higher profits with higher no: of ants.