Paper Title : Joint Optimization Strategy of Computation Offloading and Resource Allocation in Multi-access Edge Computing Environment
Paper Link : https://ieeexplore.ieee.org/document/9122416

1 Summary

1.1 Motivation

In multi-access edge computing, computation offloading and resource allocation perform an indispensable part in reducing latency by allocating computing resources effectively and choosing where to execute tasks. But there remains differences in UTD performance and MEC servers resource constraints for which balancing the optimization between energy consumption and time delay and formulating an optimal offloading and resource allocation strategy has mainly been focused in multi-user and multi-server contexts.

1.2 Contribution

The authors propose a two-stage genetic-algorithm-based heuristic optimisation technique that breaks the combined optimisation problem of computation offloading and resource allocation into two stages. They iteratively update the problem solution based on the coupling relationship between the offloading decision and the resource allocation scheme, eventually obtaining the stable convergence solution of the optimisation issue.The algorithm suggested here can always reduce the energy consumption of UTDs having good performance.

1.3 Methodology

In the MEC environment, the authors examine a scenario with several users and servers. The joint optimization problem of computation offloading and resource allocation is therefore formulated as a MINP problem. This study offers a two-stage heuristic optimisation technique based on the genetic algorithm to address the suggested MINP problem, which divides the combined optimisation problem into two stages. The genetic algorithm is utilized in the first step to solve the offloading decisions of the UTDs in the early conditions. The allocation of computing resources is revised in the second step using a myopic optimisation strategy based on the current offloading choice.

1.4 Conclusion

The authors compare the proposed algorithm with other baseline methods, and numerical results like ROA, NOA, LEA and prove that it significantly reduces execution time, improves execution efficiency and has high calculation efficiency.

2 Limitations

2.1 First Limitation

Workloads on edge devices might change over time, making it difficult to correctly forecast resource requirements. Uncertainties in task features, input data, and execution times can all have an impact on optimisation algorithm effectiveness.

2.2 Second Limitation

To accommodate an increasing number of edge devices and work, the optimisation technique needs to be scalable. The optimisation techniques must efficiently scale as the network grows in order to maintain acceptable performance levels.

3 Synthesis

First of all, apps for AR and VR demand a lot of processing power. By shifting computing to edge servers for speedy processing, joint optimisation guarantees a flawless user experience. Furthermore, the joint optimisation technique becomes essential for optimizing the advantages of high-bandwidth and low-latency networks as 5G and other network technologies advance. Computation offloading can also help autonomous cars by facilitating in-the-moment decisions based on data processed at the edge, which makes transportation safer and more effective.In order to integrate MEC with fog computing and build a complete computing infrastructure that extends from the edge to the cloud, joint optimisation is necessary.