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Block Chain Enabled Mobile Edge Computing System

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Editorial

To meet the demands of massive connections and low latency services, the European Telecommunications Standards Institute (ETSI) proposed the concept of Mobile Edge Computing (MEC), which provides computational processing and data storage capabilities for these mobile devices at the network's edge. MEC reduces service delivery end-to-end latency by relocating the cloud computing platform to the network's edge. Furthermore, it can support a wide range of business scenarios, including smart device applications, health monitoring, connected vehicles, 5G network data migration services, and even a satellite-terrestrial network. As a result, the MEC has piqued the industry's interest since its inception. This new mode may affect not only traditional service providers, but also the interaction modes of many industries and networks [1-3]. However, because MEC is a distributed architecture, it will process uploading tasks very differently than cloud computing.

As a result, it is necessary to thoroughly consider the delay of various tasks as well as whether the processing mode of tasks is economical enough. The design of a reasonable resource allocation policy in a MEC system has become the focus of industry research. The research on MEC resource allocation is currently making significant progress. Allocation policies can be classified into numerous types based on various classification criteria. Policies are classified as static or dynamic based on whether they are adjusted based on the current system status. Full allocation and partial allocation refer to whether the task is completely allocated to the MEC system for processing. Different allocation policies differ in their complexity. When making decisions, partial allocation should consider processing the task locally, and the local processing time should be compared to the processing time of uploading to the MEC server (the delay of wireless transmission must be considered).

Many solutions to the resource allocation problem have been proposed by researchers. Some algorithms are mentioned survey of optimization algorithms, such as numerical methods such as the Bisection method, Newton–Raphson, and bio-inspired algorithms, which are frequently used to solve resource allocation problems. Lyapunov Optimization [4,5] was used for resource allocation, which is also a traditional method. Some work employs reinforcement learning, a cutting-edge methodology. To optimize the real-time adaptive policy of computing resource allocation for multi-user unloading tasks, a deep Q-learning method is used. To solve the above non-convex optimization problem of joint subchannel allocation and power allocation in uplink, three frameworks based on discrete DRL, continuous DRL, and joint DRL were proposed. Furthermore, an NLP-based multiagent algorithm for a distributed information system was proposed, allowing the construction of a dynamic and organized overlay network. These policies can effectively balance task processing delay and server cost, and thus provide theoretical support for the application of MEC system.

Furthermore, security is an issue that cannot be overlooked in the MEC system. MEC may pose the following security risks: The distributed architecture indicates that the entire system, including network infrastructure, service infrastructure, and user devices, will not be controlled by a single owner. This can lead to a situation in which every aspect is vulnerable to attack. Furthermore, deployed edge computing servers frequently invoke some application programming interfaces (APIs) concerning physical and logical environments. Clients' privacy may be jeopardized if those APIs are not well-protected. These issues are critical to the MEC system's reliability. In response to the aforementioned issues, the researchers proposed block chain technology to improve the security of MEC systems. Block chain technology is a broad category that includes distributed data storage, peer-to-peer transmission, consensus mechanisms, encryption algorithms, and other computer technologies. The cost of being malicious increases due to the consensus mechanism, making the system more robust; the block chain efficiently protects clients' privacy due to the asymmetric encryption algorithm and zero-knowledge proof.

Aside from security, the block chain uses smart contracts to manage and deploy edge computing nodes autonomously. Its programmability also improves MEC's scalability. Many block chain-enabled MEC framework solutions have been proposed so far. Some of the architectures have been validated in real-world environments by researchers. Nonetheless, when block chain and MEC are combined, the resource allocation problem should be revisited. Traditional MEC resource allocation policy is primarily concerned with communication and data processing latency. However, when block chain and MEC systems are combined, the time of mining and the reward from mining can affect resource allocation policy: the former can affect total time delay, which is sensitive for clients, while the latter is associated with the allocated computing resource. As a result, more research on the resource allocation policy of block chain-enabled MEC is required. Meanwhile, some researchers have worked on resource allocation issues in block chain-based MEC systems.

Conflict of Interest

None.

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