Scheduling serverless computing applications in the cloud-edge continuum with TEE integration

Serverless computing offers scalability and cost-efficiency for cloud and edge applications, but scheduling these functions across distributed resources remains a challenge. Traditional scheduling methods struggle to handle factors like cold start time, dynamic workloads, heterogeneous resources, and security concerns in the cloud-edge continuum. Furthermore, ensuring the confidentiality and integrity of serverless functions when processing sensitive data is critical. This opens up exciting research opportunities to explore novel scheduling techniques that leverage the available Trusted Execution Environments (TEEs) for secure and efficient execution of serverless functions across cloud and edge resources.

This PhD project aims to develop innovative scheduling algorithms for serverless computing applications within the cloud-edge continuum, incorporating Trusted Execution Environments (TEEs) to enhance security and performance. The research will address the unique challenges posed by the dynamic and distributed nature of serverless computing and the heterogeneous environments of the cloud-edge continuum. It will focus on optimizing resource utilization, minimizing latency, and ensuring data privacy and integrity.

Objectives:

1. **Analyse current scheduling mechanisms:** Review existing scheduling algorithms in cloud and edge environments, identifying limitations when applied to serverless computing.
2. **Design secure scheduling algorithms:** Develop new scheduling algorithms that leverage TEEs to ensure secure execution of serverless functions across cloud-edge environments.
3. **Optimise resource allocation:** Create mechanisms to dynamically allocate resources based on workload characteristics, optimizing for both performance and cost.
4. **Evaluate performance and security:** Implement the proposed algorithms and evaluate their performance, security, and cost-effectiveness using real-world workloads and scenarios.
5. **Develop a prototype system:** Build a prototype scheduling system to demonstrate the practical applicability of the proposed approach.

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