Athlone Institute of Technology
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Smart Contract Driven Resource Management for Edge Computing

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ABSTRACT

Edge computing has witnessed a rapid growth in the past few years as more and more and resources are getting connected to the Internet. The Internet is not gaining any benefits from the current implementation of ad hoc and infrequent edge resources. Transparency and trust need to be introduced while distributing the economic benefits equally to both the edge resource provider and edge resource consumer.

By completely decentralising the edge resource marketplace these edge resources can be made available to the public in the form of cloud resource. The current project focuses on Blockchain-based Smart contract-driven resource management for Edge Computing.

INTRODUCTION

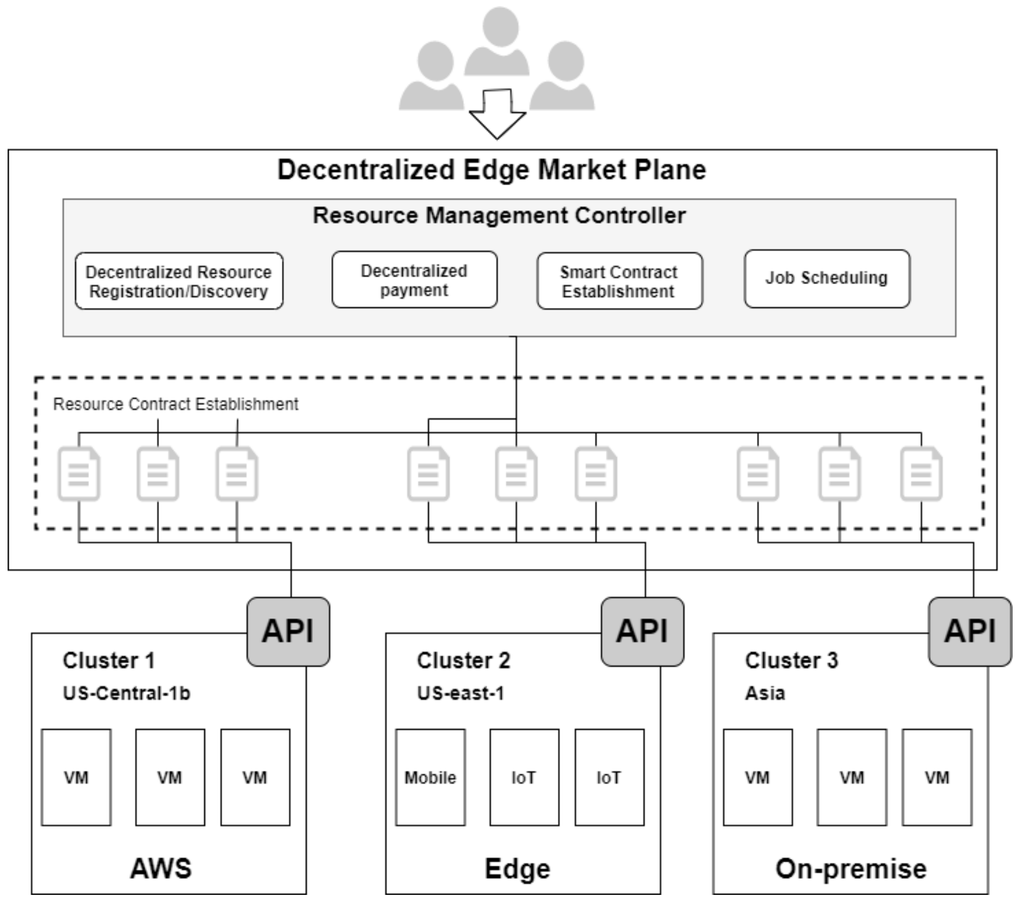
Edge computing provides compute resource with adequate network connectivity close to the device requesting resource. Edge computing is rapidly evolving to reduce the latency and bandwidth in accessing cloud resource as billions of computing devices are connected to the internet. The current research is primarily focusing on decentralizing compute resources from a centralized cloud resource provider to the Edge of network and making use of them for improving application performance. But these Edge resources are configured in an ad-hoc manner and an application or a collection of applications may use them privately. These Edge resources are not publicly available, for example like cloud resources. Additionally, such Edge resources are not distributed evenly but are also infrequent in their geographic distribution.

However, ad-hoc and infrequent Edge resources are less useful in transforming the global Internet. The economic benefits of the Edge computing should be equally accessible to both Edge resource provider and Edge resource consumer in public Internet with improved transparency and trust. Edge computing introduces one primary challenge, which is related to trust, especially when it is implemented in a distributed and decentralised manner. Edge resource governance is difficult when it is not known, who is owing and managing the Edge computing devices and whom to trust when using Edge computing services.

The above mention trust-related challenge can be solved by using Blockchain as it is a Distributed Ledger Technology. Blockchain can track and record any transaction between any two entities in a trustless manner in an immutable history record. However, there is a minimal discussion on how Edge computing resources can be brought together in a global context - federating them across multiple clusters to create a global Edge computing-based platform that is decentralized using Blockchain to ensure trust between Edge resource provider and consumer with computational fairness.

Our research aims to develop a smart contact driven resource management (orchestrator) mechanism that allows edge resource owner to establish resource sharing contract with individual compute resource consumer, including the following research objectives.

“How to create a platform that stimulates compute resource owners to contribute their compute resources smartly using blockchain smart contract to improve the qualities for service for consumer applications as well as maximize economic benefits to resource providers”, is our central research question.
To enable trading of compute resources from hybrid edge and cloud environment, Is the primary focus of the research.



METHODOLOGY

Edge The key research methodology is to investigate the functions that enables smart contract driven edge resource orchestration. The functions identified can be implemented as architecture components that will allow the monetization of the edge resource(s) on an open and transparent platform(s) which will be built on the Blockchain principles. The functions will be evaluated in the distributed edge/cloud computing context. The Edge Resource can also be used for general-purpose computing. The learnings inculcated by studying the current implementations of blockchain based decentralised cloud solution’s platforms namely Golem[1], iExec[1] and SONM[1] which implements blockchain-based solution(s) for cloud computing can be used in this project.

CONCLUSION

Edge computing is gaining momentum due to the resources getting connected in large quantities to the Internet. The development of a completely decentralised edge resource market can open the doors of edge resources to the public such as cloud resource(s) in the current cloud market.

REFERENCE

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[2] B. Varghese, N. Wang, S. Barbhuiya, P. Kilpatrick and D. S. Nikolopoulos, "Challenges and Opportunities in Edge Computing," 2016 IEEE International Conference on Smart Cloud (SmartCloud), New York, NY, 2016, pp. 20-26, doi: 10.1109/SmartCloud.2016.18.