

Bachelor Thesis

Benchmarking Blockchain-Based Applications

Benchmarking Blockchain-Based applications is complex. While transaction cost can be easily simulated, the performance (e.g., latency, throughput) depends on the interplay of many nodes in the large distributed system. Specifically, studying systems under load in an economical manner remains a challenge. Often, this leads to high uncertainty for decision makers and application developers, as it is unclear how the application will behave once deployed on the real system (i.e., mainnet) - especially in atypical situations (e.g., high congestion). Simulation approaches can help to assess implementations in quasi-realistic environments and are capable to simulate e.g., different levels of load. However, current benchmark systems focus on the system as a whole [1]. They do not natively support reactive applications, where users observe the blockchain, and execute contracts as a consequence of observed events. Such applications can, for example, be found in a process automation scenario, where tasks are executed in a prescribed order after certain conditions or events occurred [2]. For example, in a supply chain, a smart contract might automatically issue payments when shipment delivery is confirmed on-chain. In this topic, we want to integrate such capabilities in the METHODA toolchain [1], to allow the benchmarking of arbitrary applications under different simulated network conditions.

The thesis will be conducted in collaboration with the chair of Network Architectures and Services. <https://www.net.in.tum.de/members/rezabek/>

Contact

Every theses starts with an exposé, where you shape the topic towards your interest (in consultation with us). If you're interested, please contact us as outlined at <https://www.cs.cit.tum.de/en/isdo/teaching/theses/>.

Recommended Prerequisites

Familiarity with blockchain technology, Strong programming and DevOps skills

[1]: Rezabek, F., Glas, K., Von Seck, R., Aroua, A., Leonhardt, T., Carle, G.: Multilayer environment and toolchain for holistic network design and analysis. arXiv preprint arXiv:2310.16190 (2023)

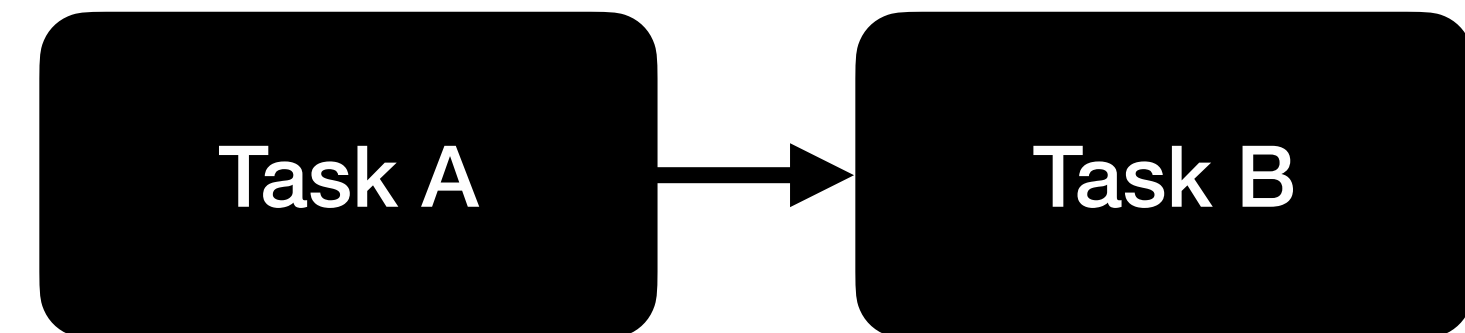
[2]: Stiehle, Fabian, and Ingo Weber. "Blockchain for business process enactment: a taxonomy and systematic literature review." International Conference on Business Process Management. Cham: Springer International Publishing, 2022.

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Tasks

1. Familiarise yourself with the METHODDA Benchmarking environment
2. Implement reactive app support for workloads. i.e., the goal is to be able to define workloads that enable to simulate (under certain network conditions):
 1. Querying the blockchain for certain events emitted by a smart contract
 2. Call a function as a consequence



Example: Task B is only executed once task A was committed on the blockchain